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Abstract

This survey pays attention to a recent development of the literature that analyzes two important regulatory features found in the Agreement on Subsidies and Countervailing Measures (the SCM agreement): the restrictive treatment of domestic subsidies and the general prohibition of export subsidies. The WTO's restriction on domestic subsidies is challenged by the existing terms-of-trade theory that offers an efficiency foundation for the market-access focus of the GATT rules. On the other hand, against the backdrop of the SCM agreement and preferential trade agreements (PTAs), a recent literature attempts to provide a rationale for the WTO to restrict the use of domestic subsidies and for trade agreements to take a deep-integration approach to domestic policies. To offer a rationale for the prohibition of export subsidies, a recent literature considers a firm-delocation externality and a profit-shifting externality in various imperfect competition settings.

Keywords: The SCM agreement; Domestic subsidies; Export subsidies; Countervailing duties; Shallow integration; Deep integration; Delocation; Profit-Shifting
JEL Codes: F12, F13

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1 Introduction

The Agreement on Subsidies and Countervailing Measures (the SCM agreement), originating from the Uruguay Round negotiations (1986-94), represents the multilateral subsidy rules of the World Trade Organization (WTO). The SCM agreement establishes a definition of the term "subsidy" and contains an explanation of the concept of "specificity." Within the meaning of the SCM agreement, a subsidy exists if it has two distinctive elements: (i) a "financial contribution" by a government or any public body within the territory of a member (or any form of income or price support in the sense of Article XVI of the General Agreement on Tariffs and Trade (GATT)); and (ii) a "benefit" is thereby conferred. A subsidy nevertheless is not subject to the disciplines of the SCM agreement unless it is specifically provided to an enterprise or industry or group of enterprises or industries. The SCM agreement creates two basic categories of subsidies: prohibited and actionable subsidies. First, except as provided in the Agreement on Agriculture, the following subsidies are prohibited: subsidies contingent, in law or in fact, whether solely or as one of several other conditions, upon export performance ("export subsidies") and subsidies contingent, whether solely or as one of several other conditions, upon the use of domestic over imported goods ("local-content subsidies"). Second, specific subsidies are actionable (i.e., subject to challenge either through multilateral dispute settlement or through countervailing action) in the event that they cause "adverse effects" to the interests of another member. Production subsidies come under this actionable category.

There are three types of adverse effects. First, there is "injury" to a domestic industry caused by subsidized imports in the territory of the complaining member. This is the sole basis for imposing a countervailing measure.[1] Second, there is "nullification or impairment" of the benefits expected by another member. A nullification-or-impairment case may occur when subsidization undercuts the improved market access presumed to flow from a bound tariff reduction. Notice that these two types of adverse effects were broadly contained in the GATT subsidy rules: they may be associated with circumstances under which a countervailing duty (CVD) and a non-violation complaint are used by a negatively affected member. Third, there is "serious prejudice." Serious prejudice is a new ingredient that was not present in the GATT rules, and it may apply when a subsidy offered by a government causes a loss of exports by another member in the subsidizing-country market or in a third-country market.

The objective of this survey is to present a recent development of the literature that

[1] The SCM agreement states "substantive requirements" that must be fulfilled to impose a countervailing measure; a member may not impose a countervailing measure unless it determines that there are subsidized imports, injury to a domestic industry, and a causal link between the two. The SCM agreement also contains detailed "procedural requirements."

analyzes two important regulatory features of the SCM agreement: the restrictive treatment of domestic subsidies and the general prohibition of export subsidies. In regard to the restrictive treatment of domestic subsidies, a recent literature highlights the regulatory feature newly present in the SCM agreement. Under the GATT rules, a government could unilaterally impose a CVD when its import-competing industry suffered material injury from subsidized imports. A government also had the right to make a non-violation complaint if it could show that a new or increased subsidy program nullified or impaired the market-access benefits that the government had reasonably anticipated at the time of the tariff negotiation. The subsidizing government, having no obligation to remove the subsidy, was then expected to make policy adjustments that would restore the negotiated market access. Under the SCM agreement, however, a domestic production subsidy is actionable regardless of whether it nullifies or impairs the market-access commitment made by the preceding tariff negotiation. Thus, a government that uses a domestic production subsidy is under pressure to remove the subsidy or at least its adverse effects regardless of the extent to which the subsidy is needed for domestic efficiency.[2]

The literature then asks the question of whether the WTO's restriction on domestic subsidies is efficiency-enhancing or has gone too far. The existing terms-of-trade theory of trade agreements shows that the inefficiency for a trade agreement to solve is traced to the terms-of-trade externality: governments would select the efficient policies if they were not motivated by the terms-of-trade gains of unilateral policy choices. The terms-of-trade theory offers an efficiency rationale for trade agreements to take a shallow-integration approach to domestic subsidies: international efficiency can be achieved by negotiations on tariffs alone under the non-violation complaints that secure market access against subsequent erosion. At the same time, the potential harm of the restriction on domestic subsidies has been raised in the terms-of-trade literature. This concern is essentially rooted in the *targeting principle* (Bhagwati and Ramaswami, 1963; Johnson, 1965) under which the government's optimal intervention targets market imperfection directly at the margin. A central message of this principle is that a government should be able to use a first-best domestic policy instrument with which to remedy a domestic market failure.

The existing terms-of-trade theory asserts that the market-access focus of the GATT rules is a proper treatment of domestic subsidies based on a key regulatory feature: under a market-access preservation rule, a government is granted the flexibility to select its domestic policies up to the point where the government's policies start eroding the market-access level anticipated by earlier tariff negotiations, and it can then achieve domestic

[2]For related discussion, see Bagwell (2008), Bagwell and Staiger (2006), Bagwell, Staiger and Sykes (2013) and Sykes (2005, 2010). For a comprehensive historical and legal background of the GATT/WTO subsidy rules, see Coppens (2014) and Jackson (2000).

efficiency while causing no market-access erosion. Evidently, the WTO's restriction on domestic subsidies is not well received by the existing terms-of-trade theory. On the other hand, we observe that recent preferential trade agreements (PTAs) go beyond eliminating tariffs on a preferential basis and include commitments of behind-the-border measures. Against the backdrop of the SCM agreement and PTAs, an emerging literature reconsiders the GATT-type market-access preservation rule to provide a rationale for trade agreements to take a deep-integration approach to domestic policies.

There is a recent research that is particularly motivated by the conceptual and practical difficulties of determining which domestic subsidies are used as undesirable protective measures; without such difficulties, restrictions on domestic subsidies could be negotiated to target only the protective use of subsidies. A key finding is that, if the magnitude of a legitimate domestic subsidy with which to address a production externality is private information, then domestic efficiency can only be achieved at the expense of the foreign welfare. The idea is that an agreement that achieves domestic efficiency allows high tariffs and thus reduces market access; the privately-informed government would otherwise raise its domestic subsidy above the Pigouvian level for the terms-of-trade gains. An optimal agreement takes a deep-integration approach to domestic subsidies and constrains domestic efficiency for the international objective of expanding market access. A related finding is established as well in a self-enforcing trade-agreement model that has a different source of private information: if domestic policies are private information and may thus be used without triggering punishment, then a trade agreement may find it optimal to allow domestic distortions for enforcement purpose.

A recent literature also calls attention to the commitment theory. According to this theory, a government uses a trade agreement as a commitment device that eliminates possible influences from ex post domestic lobbying. The literature justifies the WTO's restriction on domestic subsidies as an extended commitment device: the government signs a trade agreement that constrains both tariffs and domestic subsidies, since under a tariff-only commitment, the lobby can still influence the domestic-subsidy choice. Alternatively, the offshoring theory also offers a rationale for trade agreements to take a deep-integration form. This theory emphasizes that the rise of offshoring changes the nature of the international externality that a trade agreement must address: in the presence of offshoring where international prices are determined by bilateral bargaining between domestic importers and foreign exporters, governments typically distort domestic policy instruments, other than the tariff, for the terms-of-trade manipulation in the non-cooperative policies; therefore, a trade agreement must take a deep-integration approach to move governments from the Nash policies to the efficient policies.

This survey proceeds to analyze the second regulatory features of the SCM agreement

stated above: the general prohibition of export subsidies. The prohibition on export subsidies is puzzling from the terms-of-trade perspective. An increase in an export subsidy by the home country has a positive terms-of-trade effect on the foreign country, and this positive effect is analogous to the positive terms-of-trade effect that the foreign country would enjoy under the scenario where the home country reduces the tariff imposed on its import good. It is thus often argued that the importing country would benefit from subsidized imports and its best response would be to "send a thank you note" to the subsidizing country that exports the good. A recent literature attempts to establish two findings. First, if import tariffs are sufficiently low, then trade agreements impose restrictions on the use of export subsidies for more efficient outcomes. Second, if import tariffs are sufficiently high, then trade agreements focus on reductions in tariffs, having no necessity of imposing restrictions on the use of export subsidies. The literature then associates the first finding with the WTO's general prohibition of export subsidies and the second finding with the fact that early GATT rounds focused on reductions in import tariffs rather than reductions in export subsidies.

The literature considers a firm-delocation externality and a profit-shifting externality in various imperfect competition models. The delocation models offer a long-run interpretation of trade policies in that the number of firms in each country is endogenously determined by free-entry condition. In these models, the cross-border externalities occur through a change in local prices and its impact on consumer surplus. They show that the delocation externality can provide a rationale for the restriction on export subsidies in the linear Cournot model, but in other imperfect-market structures, the prohibition of export subsidies is difficult to establish within the delocation setting. The profit-shifting models offer a relatively short-term analysis of trade policies in that firms earn positive profits for a given number of firms in these models. They indicate that governments may enjoy self-enforcement benefits by banning export subsidies and negotiating only import tariffs. The remaining question is whether the profit-shifting externality of unilateral policy choices can offer a rationale for the prohibition of export subsidies, other than self-enforcement considerations. The answer to this question is split and depends on whether a market-access preservation rule is sufficient to prevent profit-shifting externalities from being transmitted across borders. This survey finds that, although the delocation and profit-shifting models have some success in providing a rationale for the prohibition of export subsidies, they do not explain the asymmetric treatment of export subsidies in the GATT/WTO: export subsidies are prohibited outright, but import tariffs are legal and bound by negotiations. A formal analysis of the asymmetric treatment of export subsidies is rare. A recent research on the role of CVDs is rare as well and offers no efficiency rationale for the use of CVDs.

The remainder of this survey is organized as follows. Section 2 reviews the terms-of-trade theory that offers an efficiency rationale for trade agreements to adopt a shallow-integration approach to domestic policies. Section 3 reviews the literature that provides a rationale for trade agreements to adopt a deep-integration approach to domestic policies. Section 4 presents the literature that provides an efficiency rationale for the prohibition of export subsidies. It summarizes the literature that considers a firm-delocation externality and a profit-shifting externality that may arise in various imperfect competition models. The section also introduces a small body of literature on CVDs. Section 5 concludes.

2 Domestic Subsidies and Shallow Integration

This section reviews the terms-of-trade theory that offers an efficiency rationale for trade agreements to take a shallow-integration approach to domestic policies. The terms-of-trade theory asserts that the market-access focus of the GATT rules is a proper treatment of domestic subsidies based on a key regulatory feature: under a market-access preservation rule, a government is granted the flexibility to select its domestic policies up to the point where the government's policies start eroding the market-access level anticipated by earlier tariff negotiations, and it can then achieve domestic efficiency while causing no erosion to the foreign country's market access. Evidently, the WTO's restriction on domestic subsidies is not well received by the existing terms-of-trade theory, and its potential harm is raised in the terms-of-trade literature.[3] This concern is essentially rooted in the targeting principle: the government's optimal intervention targets market imperfection directly at the margin, which suggests that a government should be able to use a first-best policy instrument with which to remedy a domestic market failure.

2.1 The Basic Partial-Equilibrium Model with Domestic Subsidies

We follow Horn, Maggi and Staiger (2010) and Lee (2016), and consider a 2-good 2-country partial-equilibrium model that is very simple and contains useful insights commonly found in terms-of-trade models.[4] In the model, trade occurs in two countries, home and foreign, where markets are perfectly competitive. For the good in the import (export) sector of

[3] In fact, the potential harm is broadly raised in the literature. See, for example, Bagwell and Staiger (2006), Mavroidis, Messerlin and Wauters (2008), Rodrik (2011) and Stiglitz (2006).

[4] The literature surveyed in this chapter is particularly interested in trade-agreement models in which governments have multiple policy instruments. Due to its simplicity and familiarity, the current basic model can be easily reformulated for other scenarios that involve multiple policy instruments.

the home (foreign) country, the home country has a downward-sloping demand function $D(p^d)$ for the local consumer price p^d and an upward-sloping supply function $Q(p^s)$ for the local supplier price p^s. For the same good, the foreign country has the demand and supply functions, $D^*(p^{*d})$ and $Q^*(p^{*s})$, where asterisks denote foreign variables. All functions are strictly positive and differentiable.

The home government has two instruments, a domestic production subsidy s and an import tariff τ, which are publicly observable, non-prohibitive and expressed in specific terms. To formalize the idea that the domestic production subsidy is a first-best instrument with which to addresses a market failure that leads to under-production, we assume that a domestic production of the import good Q by the home country generates a non-negative external value within the border. This external value is represented by a linear function θQ with a publicly observable parameter θ. We impose a symmetry restriction on the model: import-competing sectors in two countries and policy interventions by two governments are mirror images of each other. Under this restriction, we can simplify our analysis and focus on the home government's policy intervention in its import-competing sectors. In the sector under consideration, in the absence of the foreign government's intervention, the foreign consumer and producer prices are equal, $p^{*d} = p^{s*}$, and this foreign local price may be called the world price p^w. A foreign producer receives the same price for sales in the foreign country that it receives for sales in the home country after paying the tariff τ: $p^w = p^d - \tau$. The wedge between the home producer price and the home consumer price is the domestic subsidy s: $p^s = p^d + s$. These pricing equations may be rewritten as

$$p^d = p^w + \tau \text{ and } p^s = p^w + \tau + s. \tag{1}$$

Under a policy mix (s, τ), the equilibrium world price, $\widehat{p}^w$, is determined by plugging p^d and p^s into the market-clearing condition,

$$D(p^d) - Q(p^s) = Q^*(p^w) - D^*(p^w), \tag{2}$$

and equilibrium local prices are determined by $\widehat{p}^d(s,\tau) = \widehat{p}^w(s,\tau) + \tau$ and $\widehat{p}^s(s,\tau) = \widehat{p}^w(s,\tau) + \tau + s$. Now, using (1) and (2), we find that an increase in s or τ by the home government lowers the world price of the foreign export good,

$$\frac{\partial \widehat{p}^w}{\partial s} = \frac{Q'}{D' - Q' - (Q^{*\prime} - D^{*\prime})} < 0 \tag{3}$$

$$\frac{\partial \widehat{p}^w}{\partial \tau} = -\frac{D' - Q'}{D' - Q' - (Q^{*\prime} - D^{*\prime})} < 0, \tag{4}$$

and using $\widehat{p}^s = \widehat{p}^w + \tau + s$, we find that an increase in s or τ raises the domestic production

of import good,

$$\frac{\partial Q}{\partial s} = Q' \frac{\partial \widehat{p}^s}{\partial s} = \frac{Q'(D' - (Q^{*\prime} - D^{*\prime}))}{D' - Q' - (Q^{*\prime} - D^{*\prime})} > 0 \text{ and} \tag{5}$$

$$\frac{\partial Q}{\partial \tau} = Q' \frac{\partial \widehat{p}^s}{\partial \tau} = -\frac{Q'(Q^{*\prime} - D^{*\prime})}{D' - Q' - (Q^{*\prime} - D^{*\prime})} > 0. \tag{6}$$

Thus, the tariff is more effective than the subsidy to lower the world price, $\frac{\partial \widehat{p}^w}{\partial \tau} < \frac{\partial \widehat{p}^w}{\partial s} < 0$, and the subsidy is more effective than the tariff to increase domestic production, $\frac{\partial Q}{\partial s} > \frac{\partial Q}{\partial \tau} > 0$.

The home welfare consists of consumer surplus, profits, net revenue (revenue from the import tariff τ minus expenditures on the production subsidy s) and the external value of domestic production:

$$W(s, \tau; \theta) \equiv CS(\widehat{p}^d) + \Pi(\widehat{p}^s) + \tau \cdot M(s, \tau) - s \cdot Q(\widehat{p}^s) + \theta Q(\widehat{p}^s), \tag{7}$$

where $M(s, \tau) \equiv D(\widehat{p}^d) - Q(\widehat{p}^s)$.[5] Consumers and producers enjoy the surplus for relevant prices, $CS(\widehat{p}^d) \equiv \int_{\widehat{p}^d}^{\overline{p}} D(p)dp$ and $\Pi(\widehat{p}^s) \equiv \int_{\underline{p}}^{\widehat{p}^s} Q(p)dp$, for $\overline{p} = \sup\{p : D(p) > 0\}$ and $\underline{p} = \inf\{p : Q(p) > 0\}$. The policy mix (s, τ) selected by the home government affects the foreign welfare through the world price:

$$W^*(s, \tau) \equiv CS^*(\widehat{p}^w) + \Pi^*(\widehat{p}^w). \tag{8}$$

The global (joint) welfare becomes

$$W^G(s, \tau; \theta) \equiv W(s, \tau; \theta) + W^*(s, \tau).$$

It is assumed that $W(s, \tau)$ and $W^*(s, \tau)$ are strictly concave on (s, τ). This assumption implies that $W^G(s, \tau)$ is also strictly concave.

The model has an international externality that travels through the world price. If the foreign country's terms of trade deteriorates (i.e., the world price decreases), then the home welfare increases but the foreign welfare decreases. Rewriting the home welfare (7)

[5] The current model can be directly reformulated to become a lobbying model in which government intervention is justified by domestic political pressure as in Baldwin (1987). This model accommodates a political-economy externality by placing an additional weight θ on producer surplus, $(1+\theta)\Pi(\widehat{p}^s)$. The home welfare function then becomes

$$W(s, \tau) \equiv CS(\widehat{p}^d) + \Pi(\widehat{p}^s) + \tau \cdot M(s, \tau) - s \cdot Q(\widehat{p}^s) + \theta \cdot \Pi(\widehat{p}^s).$$

The external-value term changes from $\theta Q(\widehat{p}^s)$ to $\theta \Pi(\widehat{p}^s)$, and the marginal impact of policy instrument $x \in \{s, \tau\}$ on the external value is the same: $\frac{\partial \theta Q(\widehat{p}^s)}{\partial x} = \frac{\partial \theta \Pi(\widehat{p}^s)}{\partial x}$.

as functions of equilibrium prices,

$$W(\widehat{p}^w, \widehat{p}^d, \widehat{p}^s) = CS(\widehat{p}^d) + \Pi(\widehat{p}^s) + (\widehat{p}^d - \widehat{p}^w)[D(\widehat{p}^d) - Q(\widehat{p}^s)] - (\widehat{p}^s - \widehat{p}^d)Q(\widehat{p}^s) + \theta Q(\widehat{p}^s),$$

and using the foreign welfare (8) directly, we find that

$$W_{\widehat{p}^w} = -[D(\widehat{p}^d) - Q(\widehat{p}^s)] < 0 \text{ and } W^*_{\widehat{p}^w} = [Q^*(\widehat{p}^w) - D^*(\widehat{p}^w)] > 0. \tag{9}$$

The terms $W_{\widehat{p}^w}$ and $W^*_{\widehat{p}^w}$ thus represent the income effects of a terms-of-trade change amounting to the trade volume in the model. In addition, the model has the relationship between the world price and trade volume, since the market-clearing condition $M(s,\tau) = E^*(\widehat{p}^w) \equiv Q^*(\widehat{p}^w) - D^*(\widehat{p}^w)$ indicates that the equilibrium trade volume is constant (increases) when the world price is constant (increases).[6] Using (3) and (4), we find that an iso-world-price function can be represented by a strictly decreasing function with the slope,

$$\left.\frac{d\tau}{ds}\right|_{d\widehat{p}^w=0} = -\frac{\partial \widehat{p}^w/\partial s}{\partial \widehat{p}^w/\partial \tau} = \frac{Q'}{D' - Q'} < 0, \tag{10}$$

and using

$$\frac{\partial M}{\partial s} = \frac{\partial E^*}{\partial s} = (Q^{*\prime} - D^{*\prime})\frac{\partial \widehat{p}^w}{\partial s} \text{ and } \frac{\partial M}{\partial \tau} = \frac{\partial E^*}{\partial \tau} = (Q^{*\prime} - D^{*\prime})\frac{\partial \widehat{p}^w}{\partial \tau},$$

we find that an iso-trade-volume function is also a strictly decreasing function with the slope,

$$\left.\frac{d\tau}{ds}\right|_{dM=0} = -\frac{\partial M/\partial s}{\partial M/\partial \tau} = \frac{Q'}{D' - Q'} < 0.$$

If an iso-world-price function shifts down (up), then the world price increases (decreases) and the trade volume increases (decreases).

We now characterize the efficient and Nash policies. The efficient policy mix (s^E, τ^E) that maximizes the global welfare $W^G(s,\tau;\theta)$ satisfies the first-order conditions:

$$\frac{\partial W^G(s,\tau;\theta)}{\partial s} = \tau\frac{\partial M}{\partial s} + [\theta - s]\frac{\partial Q}{\partial s} = 0 \text{ and} \tag{11}$$

$$\frac{\partial W^G(s,\tau;\theta)}{\partial \tau} = \tau\frac{\partial M}{\partial \tau} + [\theta - s]\frac{\partial Q}{\partial \tau} = 0, \tag{12}$$

where $\frac{\partial M}{\partial s}$, $\frac{\partial Q}{\partial s}$, $\frac{\partial M}{\partial \tau}$ and $\frac{\partial Q}{\partial \tau}$ are given above. Thus, in the efficient policy mix, the home government selects the Pigouvian subsidy that internalizes the externality at the margin

[6] In this partial-equilibrium model, the trade volume is determined by the world price, because the world price equals the foreign local price in the foreign export sector that has no policy intervention.

at zero tariffs:

$$s^E = \theta \text{ and } \tau^E = 0 \text{ for all } \theta.$$

The Nash (non-cooperative) policy mix (s^N, τ^N) that maximizes the home welfare $W(s, \tau; \theta)$ satisfies the first-order conditions:

$$\frac{\partial W(s,\tau;\theta)}{\partial s} = -M\frac{\partial \widehat{p}^w}{\partial s} + \tau\frac{\partial M}{\partial s} + [\theta - s]\frac{\partial Q}{\partial s} = 0 \text{ and} \tag{13}$$

$$\frac{\partial W(s,\tau;\theta)}{\partial \tau} = -M\frac{\partial \widehat{p}^w}{\partial \tau} + \tau\frac{\partial M}{\partial \tau} + [\theta - s]\frac{\partial Q}{\partial \tau} = 0. \tag{14}$$

These two equations are satisfied by $s = \theta$ and $\tau = \frac{\partial \widehat{p}^w/\partial \tau}{\partial M/\partial \tau} M = \frac{\partial \widehat{p}^w/\partial s}{\partial M/\partial s} M$. Plugging related terms given above, we have the Nash policies:

$$s^N = \theta \text{ and } \tau^N = \frac{E^*(\widehat{p}^w)}{E^{*\prime}(\widehat{p}^w)} \text{ for all } \theta, \tag{15}$$

where $\widehat{p}^w$ is evaluated at the Nash policies. We can gain some insights from the first-order conditions stated above. The first terms in (13) and (14), $-M\frac{\partial \widehat{p}^w}{\partial s}$ and $-M\frac{\partial \widehat{p}^w}{\partial \tau}$, capture the terms-of-trade motivation contained in the home government's policy choice given that these terms respectively equal $W_{\widehat{p}^w}\frac{\partial \widehat{p}^w}{\partial s}$ and $W_{\widehat{p}^w}\frac{\partial \widehat{p}^w}{\partial \tau}$. The remaining terms capture how policy choices affect the home welfare through local prices:

$$W_{\widehat{p}^s}\frac{\partial \widehat{p}^s}{\partial s} + W_{\widehat{p}^d}\frac{\partial \widehat{p}^d}{\partial s} = \tau\frac{\partial M}{\partial s} + [\theta - s]\frac{\partial Q}{\partial s} \text{ and } W_{\widehat{p}^s}\frac{\partial \widehat{p}^s}{\partial \tau} + W_{\widehat{p}^d}\frac{\partial \widehat{p}^d}{\partial \tau} = \tau\frac{\partial M}{\partial \tau} + [\theta - s]\frac{\partial Q}{\partial \tau}.$$

In the efficient policies, by contrast, the terms-of-trade motivation vanishes,

$$(W_{\widehat{p}^w} + W^*_{\widehat{p}^w})\frac{\partial \widehat{p}^w}{\partial s} = 0 \text{ and } (W_{\widehat{p}^w} + W^*_{\widehat{p}^w})\frac{\partial \widehat{p}^w}{\partial \tau} = 0,$$

where $(W_{\widehat{p}^w} + W^*_{\widehat{p}^w}) = 0$ from (2) and (9). The first-order conditions in (11) and (12) thus represent how policy choices affect the home welfare through local prices.

A notable feature is that, either in the efficient or Nash policies, the home government with type θ achieves domestic efficiency by selecting the Pigouvian subsidy θ that internalizes the externality at the margin. The only difference in the Nash policies is that the home government uses the best instrument to capture the terms-of-trade gains, the tariff. As a result, the tariff is inefficiently high and the trade volume is inefficiently low in the Nash policies. Now, to move the home government from the Nash policies to the efficient policies, the tariff commitment (free trade) is needed, but it causes the incentive problem that is commonly featured at the theoretical and policy levels: as the first-order conditions indicate, subsequent to the tariff commitment, the home government has incentive to raise

its subsidy above the Pigouvian level.[7] By doing so, the home government can lower the world price and bring a terms-of-trade gain (loss) to the home (foreign) country. At this point, we introduce a market-access preservation rule. In this survey, we refer to the rule in broad terms in various contexts but consistently from the perspective of the importing country's policies; we say that a set of trade and domestic policies keeps a market-access preservation rule if the importing country with the set of policies preserves its import demand at a certain level or above.[8] We can now show that international efficiency can be achieved by the commitment to zero tariffs under a market-access preservation rule: the market-access level implied by the tariff commitment has the corresponding world price $\widehat{p}^w(\theta, 0)$, and the home government can increase the home welfare by raising its subsidy above the Pigouvian level θ, but only if it reduces the world price below $\widehat{p}^w(\theta, 0)$ and violates the negotiated market access.[9]

We can extend the current discussion broadly to the terms-of-trade models in which international externalities travel only through the terms of trade. The terms-of-trade theory shows that the inefficiency for a trade agreement to solve is traced to the domestic government's unilateral incentive to use tariffs and capture the terms-of-trade gains. The terms-of-trade theory thus provides an efficiency rationale for trade agreements to adopt a shallow-integration approach to domestic policies: international efficiency can be achieved by tariff commitments alone under the regulatory environment that secures market access against potential subsequent erosion. In a more complex policy environment, Staiger and Sykes (2011) make a similar point by showing that a central task for a trade agreement to address is to reduce tariffs and expand trade volumes without causing subsequent distortions in domestic policies.

[7] Empirical research suggests that tariff commitments may motivate the use of domestic measures as a secondary means of import protection. See, for example, Broda, Limao and Weinstein (2008) and Ederington and Minier (2003).

[8] Notice that we here adopt the concept of the market-access level used in the terms-of-trade literature as in Bagwell and Staiger (1999, 2002). In fact, while there are many ways to alter market-access levels, the GATT's legal approach was designed to facilitate policy changes that expand market access from importing countries. Moreover, as Hudec (1990) documents, it was well-understood by GATT drafters that tariff cuts were not sufficient to enhance market access; market-access implications of tariff cuts might be undermined by changes in behind-the-border policies. The non-violation clause was thus included in the original 1947 GATT dispute settlement articles. It is contained in GATT Article XXIII:1 on Nullification or Impairment.

[9] To support this argument further, consider a policy set $\{(s, \tau) : \widehat{p}^w(s, \tau) = \widehat{p}^w(\theta, 0)\}$ in which any policy mix (s, τ) preserves the same world price $\widehat{p}^w(\theta, 0)$ and thus secures the negotiated market access. We can follow Lemma 3 in Lee (2016) and show that, under the policy set, the home government maximizes $W(s, \tau; \theta)$ at the policy point $(\theta, 0)$; the government with type θ selects the Pigouvian subsidy, $s = \theta$, and given $s = \theta$, it selects $\tau = 0$ to satisfy the constraint $\widehat{p}^w(s, \tau) = \widehat{p}^w(\theta, 0)$.

2.2 Domestic Subsidies in General Equilibrium

The terms-of-trade theory is presented at a more general level in Bagwell and Staiger (1999, 2001, 2002, 2006) and Bagwell, Bown and Staiger (forthcoming). In this subsection, while relying heavily on these previous interpretations of the terms-of-trade theory, we focus on Bagwell and Staiger (2001) and Bagwell and Staiger (2006). We consider Bagwell and Staiger (2001) to provide the general themes of the terms-of-trade theory under the policy environment where governments have trade and domestic policy instruments. We then turn to Bagwell and Staiger (2006) to present these themes specifically in a trade-agreement model where governments use domestic subsidies.

2.2.1 Shallow Integration with Domestic Standards

Bagwell and Staiger (2001) develop a 2-good 2-country trade model in which home and foreign countries consume and produce two goods, x and y, under perfectly competitive markets. The home (foreign) country is the natural importer of x (y). The local relative price facing home (foreign) producers and consumers is $p \equiv \frac{p_x}{p_y}$ ($p^* \equiv \frac{p_x^*}{p_y^*}$). Denoting non-prohibitive home and foreign ad valorem tariffs by t and t^* and letting $\tau \equiv 1+t$ and $\tau^* \equiv 1+t^*$, we have $p = \tau p^w \equiv p(\tau, p^w)$ and $p^* = \frac{p^w}{\tau^*} \equiv p^*(\tau^*, p^w)$, where $p^w \equiv \frac{p_x^*}{p_y}$ is the world (untaxed) relative price. The foreign terms of trade is p^w and the home terms of trade is $\frac{1}{p^w}$. The model introduces behind-the-border measures, represented by a home standard σ and a foreign standard σ^* (e.g., standards used for a labor or environmental regulation), which impact production possibilities in each country: for a given local price in a country, a change in the standard alters the country's production choices and thus shifts its import demand and export supply functions. For any local and world prices, the home import demand of x is given by $M(\sigma, p, p^w)$ and the home export of y is given by $E(\sigma, p, p^w)$. The foreign import and export functions are respectively given by $M^*(\sigma^*, p^*, p^w)$ and $E^*(\sigma^*, p^*, p^w)$. For any prices, home and foreign budget constraints are represented by

$$p^w M(\sigma, p, p^w) = E(\sigma, p, p^w) \text{ and } M^*(\sigma^*, p^*, p^w) = p^w E^*(\sigma^*, p^*, p^w). \tag{16}$$

The equilibrium world price $\widehat{p}^w(\sigma, \sigma^*, \tau, \tau^*)$ is determined by the market-clearing condition for x,

$$M(\sigma, p, p^w) = E^*(\sigma^*, p^*, p^w), \tag{17}$$

and the market clearing for y is implied by (16) and (17). For market-clearing prices, $\widehat{p}^w = \widehat{p}^w(\sigma, \sigma^*, \tau, \tau^*)$, $p = p(\tau, \widehat{p}^w)$ and $p^* = p^*(\tau^*, \widehat{p}^w)$, the Metzler and Lerner Paradoxes

are ruled out by the restrictions on prices,

$$\frac{\partial p}{\partial \tau} > 0 > \frac{\partial \widehat{p}^w}{\partial \tau} \text{ and } \frac{\partial p^*}{\partial \tau^*} < 0 < \frac{\partial \widehat{p}^w}{\partial \tau^*},$$

which indicates that an increase in a country's tariff makes the country more protective and raises the local price of the import good, and that it improves the country's terms of trade. It is also assumed that an increase in a country's standard improves its terms of trade:

$$\frac{\partial \widehat{p}^w}{\partial \sigma} < 0 \text{ and } \frac{\partial \widehat{p}^w}{\partial \sigma^*} > 0.$$

The government's welfare functions are represented by $W(\sigma, p, \widehat{p}^w)$ and $W^*(\sigma^*, p^*, \widehat{p}^w)$. Notice that a government's policy choices affect its trading partner's welfare only through the effect that its choices have on world prices. Other than a strict concavity with respect to policy instruments, the only additional restriction on the welfare functions is that each government has higher welfare when its terms of trade improve:

$$W_{\widehat{p}^w}(\sigma, p, \widehat{p}^w) < 0 < W^*_{\widehat{p}^w}(\sigma^*, p^*, \widehat{p}^w). \tag{18}$$

The Nash and the efficient policies can now be characterized. The Nash policies solve the first-order conditions for τ, σ, τ^* and σ^*:

$$\begin{aligned}
W_p \frac{dp}{d\tau} + W_{\widehat{p}^w} \frac{\partial \widehat{p}^w}{\partial \tau} &= 0, \\
W_\sigma + [\tau W_p + W_{\widehat{p}^w}] \frac{\partial \widehat{p}^w}{\partial \sigma} &= 0, \\
W^*_{p^*} \frac{dp^*}{d\tau^*} + W^*_{\widehat{p}^w} \frac{\partial \widehat{p}^w}{\partial \tau^*} &= 0 \text{ and} \\
W^*_{\sigma^*} + [\frac{1}{\tau^*} W^*_{p^*} + W^*_{\widehat{p}^w}] \frac{\partial \widehat{p}^w}{\partial \sigma^*} &= 0.
\end{aligned}$$

Efficient policies, $(\sigma^E, \tau^E, \sigma^{*E}, \tau^{*E})$, can be established by the two tangency conditions: (i) on the space of the home policy instruments (σ, τ) (the foreign policy instruments (σ^*, τ^*)), the home (foreign) welfare function is tangent to the iso-world-price function that is the indifference curve of the foreign (home) country and (ii) on the space of tariffs (τ, τ^*), the home and foreign welfare functions are tangent to each other, $\frac{d\tau}{d\tau^*}\big|_{dW=0} = \frac{d\tau}{d\tau^*}\big|_{dW^*=0}$.

The tangency condition (i) can be written as[10]

$$W_\sigma\left(\frac{1}{\partial\widehat{p}^w/\partial\sigma}\right)=W_p\left(\frac{\widehat{p}^w}{\partial\widehat{p}^w/\partial\tau}\right)\text{ and }W^*_{\sigma^*}\left(\frac{1}{\partial\widehat{p}^w/\partial\sigma^*}\right)=W^*_{p^*}\left(\frac{-p^*/\tau^*}{\partial\widehat{p}^w/\partial\tau^*}\right),\qquad(19)$$

and the tangency condition (ii) can be written as

$$\frac{[\tau W_p+W_{\widehat{p}^w}]\frac{\partial\widehat{p}^w}{\partial\tau^*}}{W_p\frac{dp}{d\tau}+W_{\widehat{p}^w}\frac{\partial\widehat{p}^w}{\partial\tau}}=\frac{W^*_{p^*}\frac{dp^*}{d\tau^*}+W^*_{\widehat{p}^w}\frac{\partial\widehat{p}^w}{\partial\tau^*}}{[\frac{1}{\tau^*}W^*_p+W^*_{\widehat{p}^w}]\frac{\partial\widehat{p}^w}{\partial\tau}}.\qquad(20)$$

Bagwell and Staiger (2001) consider a hypothetical home (foreign) government that acts as if $W_{\widehat{p}^w}\equiv 0$ ($W^*_{\widehat{p}^w}\equiv 0$). The first-order conditions for the Nash policies imply that, if these hypothetical governments were to select their policies non-cooperatively, then they would unilaterally select the *politically optimal policies* defined by

$$W_p(\sigma,p,\widehat{p}^w)=W_\sigma(\sigma,p,\widehat{p}^w)=0\text{ and }W^*_{p^*}(\sigma^*,p^*,\widehat{p}^w)=W^*_{\sigma^*}(\sigma^*,p^*,\widehat{p}^w)=0.\qquad(21)$$

We observe that these politically optimal policies are efficient because the two tangency conditions in (19) and (20) are satisfied when evaluated at politically optimal policies. In other words, politically optimal policies are those policies that hypothetical governments would unilaterally select if they did not value the terms-of-trade implications of their choices, and those policies are indeed efficient. Hence, we may conclude that the terms-of-trade externality is the sole problem for a trade agreement to address.

The terms-of-trade theory provides an efficiency foundation for trade agreements to adopt a shallow-integration approach to behind-the-border measures: international efficiency can be achieved by negotiations on tariffs alone under the non-violation complaints that secure market access against potential subsequent erosion. To gain some underlying insights, notice from (17) that the equilibrium trade volume remains constant on the iso-world-price function stated above; thus, the tangency condition (i) means that each government selects an efficient policy combination according to its own preference on the iso-trade-volume function. On the other hand, the tangency condition (ii) ensures that the home and foreign tariffs are determined such that the trade volume is at an efficient level. Now, notice that the Nash equilibrium satisfies the tangency condition (i): the first (second) condition in (19) is implied by the first (last) two equations in the first-order

[10]The tangency condition (i) means that each country selects its policies at which it would not gain from a change in its policies that keep its trading partner indifferent. We can derive two equalities from this condition: for $\widehat{p}^w$ constant on the space of (σ,τ), we have $W_\sigma+W_p\frac{dp}{d\tau}\frac{d\tau}{d\sigma}=0$, where $\frac{dp}{d\tau}=\widehat{p}^w$ and $\frac{d\tau}{d\sigma}=-\frac{\partial\widehat{p}^w/\partial\sigma}{\partial\widehat{p}^w/\partial\tau}>0$, and for $\widehat{p}^w$ constant on the space of (σ^*,τ^*), we have $W^*_{\sigma^*}+W_{p^*}\frac{dp^*}{d\tau^*}\frac{d\tau^*}{d\sigma^*}=0$, where $\frac{dp^*}{d\tau^*}=-\frac{\widehat{p}^w}{\tau^{*2}}=-\frac{\widehat{p}^w/\tau^*}{\tau^*}=-\frac{p^*}{\tau^*}$ and $\frac{d\tau^*}{d\sigma^*}=-\frac{\partial\widehat{p}^w/\partial\sigma^*}{\partial\widehat{p}^w/\partial\tau^*}>0$.

conditions for the Nash policies. The Nash equilibrium violates only the tangency condition (ii) that determines the efficient tariffs and trade volume. Thus, a shallow-integration approach achieves international efficiency in the setting. This finding implies that international efficiency may not need deep integration even when it can be achieved by deep integration as well and that deep integration may then be preferred by governments on grounds of national sovereignty.[11]

Ederington (2001) presents related themes in a self-enforcing trade agreement where each government has two policy instruments, an import tariff and a domestic production tax/subsidy, and uses its domestic policy instrument to address a non-pecunary externality that domestic production generates within the border. Ederington shows that the most cooperative self-enforcing agreement is achieved when domestic policies are set at the Pigouvian level to internalize the externality at the margin and import tariffs are tailored to the critical level at which the self-enforcement constraint is binding. This finding means that the value of cooperation is maximized when domestic policies are undistorted and the trade volume is expanded up to the critical level; the most cooperative agreement thus allows protective measures only in the form of tariffs while keeping domestic policies undistorted.[12]

2.2.2 Shallow Integration with Domestic Subsidies

Bagwell and Staiger (2006) allow for domestic policy instruments in a 2-good 2-country general-equilibrium model. The set of policy instruments available for the home government includes an import tax, a domestic consumption tax and a domestic production subsidy, so that the redundancy of policy instruments is utilized for efficient outcomes.

In the model, s denotes one plus the ad valorem production subsidy offered to producers of the import-competing good x, and t denotes one plus the ad valorem consumption tax imposed on consumption of x.[13] Given the domestic price of y, p_y, there are local relative prices for producers and consumers, $q \equiv \frac{q_x}{p_y}$ and $p \equiv \frac{p_x}{p_y}$, where q_x is the domestic producer price and p_x is the domestic consumer price. We then have the relationship between local prices and the world price: $q = s\tau p^w \equiv q(s, \tau, p^w)$, $p = t\tau p^w \equiv p(t, \tau, p^w)$

[11] In the following section, we will argue that a shallow-integration approach to behind-the-border policies may not achieve the international welfare attainable by a deep-integration approach in the presence of private information.

[12] Lee (2007) develops a partial-equilibrium model in which a trade agreement is self-enforced when governments have private information about the magnitude of the domestic production externality. Lee shows that an optimal agreement allows governments to raise import tariffs in order to prevent terms-of-trade-driven governments from distorting their domestic policies for disguised protectionism.

[13] If $s > 1$ ($s < 1$), then s is a production subsidy (tax), and if $t > 1$ ($t < 1$), then t is a consumption tax (subsidy).

and $p^* = \frac{p^w}{\tau^*} \equiv p^*(\tau^*, p^w)$, where $p^w \equiv \frac{p_x^*}{p_y}$. The home and foreign budget constraints are

$$p^w M(q, p, p^w) = E(q, p, p^w) \text{ and } M^*(p^*, p^w) = p^w E^*(p^*, p^w). \tag{22}$$

The equilibrium world price $\widehat{p}^w(s, t, \tau, \tau^*)$ is determined by the market-clearing condition for x:

$$M(q, p, p^w) = E^*(p^*, p^w), \tag{23}$$

and the market clearing for y is implied by (22) and (23). For market-clearing prices, $\widehat{p}^w = \widehat{p}^w(s, t, \tau, \tau^*)$, $q = q(s, \tau, \widehat{p}^w)$, $p = p(t, \tau, \widehat{p}^w)$ and $p^* = p^*(\tau^*, \widehat{p}^w)$, the Metzler/Lerner-type Paradoxes are ruled out by the assumptions:

$$\frac{\partial \widehat{p}^w}{\partial s} < 0,\ \frac{\partial \widehat{p}^w}{\partial t} < 0,\ \frac{\partial \widehat{p}^w}{\partial \tau} < 0 < \frac{\partial \widehat{p}^w}{\partial \tau^*} \text{ and } \frac{dq}{d\tau} = \frac{s}{t}\frac{dp}{d\tau} > 0 > \frac{dp^*}{d\tau^*}.$$

Additional restrictions are imposed on welfare functions: each government prefer an improvement of its terms of trade, $W_{\widehat{p}^w}(q, p, \widehat{p}^w) < 0 < W^*_{\widehat{p}^w}(p^* \widehat{p}^w)$, and on the efficiency frontier, with its trading partner's policies fixed, each government prefers to raise its tariff, $\frac{dW}{d\tau} > 0$ and $\frac{dW^*}{d\tau^*} > 0$.

Bagwell and Staiger (2006) consider the GATT subsidy rules in the 3-stage game: in stage 1, governments negotiate tariffs $(\widehat{\tau}, \widehat{\tau}^*)$; in stage 2, given the tariff commitment, the home government selects a domestic policy mix $(\widehat{s}, \widehat{t})$; and in stage 3, the foreign government determine whether to make a non-violation or a CVD claim. In this game, subsequent to tariff commitment, the home government is granted the flexibility to select domestic policies within the GATT subsidy rules. Importantly, the rich instrumental availability affords the home government policy redundancy: one of three instruments is redundant in light of the other two, which indicates that the efficient payoffs associated with a point on the efficiency frontier denoted by $(s^E, t^E, \tau^E, \tau^{*E})$ can be equivalently delivered with the alternative combination $(\frac{s^E}{\alpha}, \frac{t^E}{\alpha}, \alpha\tau^E, \tau^{*E})$ for any $\alpha > 0$. Define $\widehat{\tau}^E$ implicitly by $\widehat{p}^w(s_0, t_0, \widehat{\tau}^E, \tau^{*E}) = \widehat{p}^{wE}$, where $\widehat{p}^{wE}$ is evaluated at $(s^E, t^E, \tau^E, \tau^{*E})$ and (s_0, t_0) is the existing domestic policy mix prior to the negotiation. Define next $\widehat{\alpha} \equiv \frac{\widehat{\tau}^E}{\tau^E}$. Then the efficient policy mix $(s^E, t^E, \tau^E, \tau^{*E})$ is equivalent to the alternative efficient policy mix $(\frac{s^E}{\widehat{\alpha}}, \frac{t^E}{\widehat{\alpha}}, \widehat{\tau}^E, \tau^{*E})$. Now, suppose that the stage-1 tariff negotiation is $(\widehat{\tau} = \widehat{\tau}^E, \widehat{\tau}^* = \tau^{*E})$, so that the market-access level implied by the tariff negotiation is efficient and represented by the stage 1-world price, $\widehat{p}_1^w = \widehat{p}^{wE}$. If the home government selects the candidate policy mix $(\widehat{s} = \frac{s^E}{\widehat{\alpha}}, \widehat{t} = \frac{t^E}{\widehat{\alpha}})$ in stage 2, then the negotiated market access will be preserved in stage 2, $\widehat{p}_2^w = \widehat{p}^{wE}$, and the efficient payoffs associated with $(s^E, t^E, \tau^E, \tau^{*E})$ will be attained with no stage-3 claim from the foreign government.

Under three possible scenarios, the home government would have no gain by deviating

from the candidate policy mix ($\widehat{s} = \frac{s^E}{\widehat{\alpha}}, \widehat{t} = \frac{t^E}{\widehat{\alpha}}$) in stage 2. First, a deviation keeping $\widehat{p}_2^w = \widehat{p}^{wE}$ will not occur, because any potential deviation that increases the home welfare and preserves the foreign welfare contradicts the efficiency of $(s^E, t^E, \tau^E, \tau^{*E})$. Second, a deviation causing $\widehat{p}_2^w < \widehat{p}^{wE}$ has no home-welfare gain, because in stage 3, the foreign government makes a non-violation claim, and the deviating government must recover the market-access level and select $(\widehat{s}, \widehat{t})$ that is consistent with $\widehat{p}^w(\widehat{s}, \widehat{t}, \widehat{\tau}^E, \tau^{*E}) = \widehat{p}^{wE}$ and is not better than $(\widehat{s} = \frac{s^E}{\widehat{\alpha}}, \widehat{t} = \frac{t^E}{\widehat{\alpha}})$. Third, a deviation leading to $\widehat{p}_2^w > \widehat{p}^{wE}$ will not occur because it decreases the home welfare given the restriction imposed on welfare functions.[14]

This finding reconfirms the term-of-trade theory's support for trade agreements to adopt a shallow-integration approach to domestic policies: under the non-violation complaints, if market access is secured at the negotiated level, then international efficiency can be achieved by negotiations on tariffs alone. This finding also holds when a non-violation claim is costly and the cost is borne by the claimant. To gain some intuition, define $\widehat{\tau}^E$ implicitly by $\widehat{p}^w(s_0, t_0, \widehat{\tau}^E, \tau^{*E}) = \widehat{p}_1^w$ and let $\widehat{\alpha} \equiv \frac{\widehat{\tau}^E}{\tau^E}$. An efficient point $(s^E, t^E, \tau^E, \tau^{*E})$ is then equivalent to the alternative efficient policy mix $(\frac{s^E}{\widehat{\alpha}}, \frac{t^E}{\widehat{\alpha}}, \widehat{\tau}^E, \tau^{*E})$. The stage-1 negotiated tariffs $(\widehat{\tau} = \widehat{\tau}^E, \widehat{\tau}^* = \tau^{*E})$ are now arranged to imply that the stage 1-world price is $\widehat{p}_1^w$, and that the home government stage-2 choice $(\widehat{s} = \frac{s^E}{\widehat{\alpha}}, \widehat{t} = \frac{t^E}{\widehat{\alpha}})$ reduces market access to the efficient level, $\widehat{p}_1^w > \widehat{p}_2^w = \widehat{p}^{wE}$, so that the non-violation threat has its "trigger point" at the efficient level of market access. The redundancy of policy instruments allows market access to slip back to the trigger point while keeping domestic efficiency.

Bagwell and Staiger (2006) next consider the SCM agreement in an extended game that includes an additional stage between stage 2 and 3 of the original game. In the new stage, if $\widehat{s} \neq 1$, then the foreign government determines whether to challenge the production subsidy under the SCM agreement, and if the subsidy is challenged, then $s = 1$ and the home government may subsequently adjust $\widehat{t}$. A central feature of this extended game is that the stage-1 tariff negotiation $(\widehat{\tau} = \widehat{\tau}^E, \widehat{\tau}^* = \tau^{*E})$, followed by the stage 2-selection $(\widehat{s} = \frac{s^E}{\widehat{\alpha}}, \widehat{t} = \frac{t^E}{\widehat{\alpha}})$, may elicit an SCM challenge from the foreign government. To have an idea of why an SCM challenge may arise in the additional stage, select an efficient outcome $(s^E, t^E, \tau^E, \tau^{*E})$ and suppose that $\widehat{s} = \frac{s^E}{\widehat{\alpha}} > 1$ and $\widehat{s}$ is sufficiently large given that $\widehat{\alpha}$ varies with (s_0, t_0). Then for the efficient outcome $(s^E, t^E, \tau^E, \tau^{*E})$, the restriction

[14] A deviation that leads to $\widehat{p}_2^w > \widehat{p}^{wE}$ may arise from an increase in the production subsidy offered to domestic exporting firms. This deviation may face a CVD claim from the foreign government, because the output of the foreign import-competing sector contracts due to the increase in the world price, $\widehat{p}_2^w > \widehat{p}^{wE}$. With $\frac{\partial \widehat{p}^w}{\partial \tau^*} > 0$ as assumed above, the stage-3 CVD imposed by the foreign government would further increase the world price above $\widehat{p}_2^w$. Notice that the CVD claim plays no role in supporting efficient outcomes; the home government's deviation would not occur, since given the foreign tariff τ^{*E}, the government would not gain from changes in its domestic policies that cause an increase in the world price under the restriction on $W_{\widehat{p}^w}(q, p, \widehat{p}^w) < 0$.

$s = 1$, implied by an SCM challenge from the foreign government, will not be met by the home government's increase in $\widehat{t}$ that keeps the world price at $\widehat{p}^{wE}$; under the restriction $s = 1$, a sufficiently large $\widehat{s}$ in the setting means that the home government will not find it worthwhile to incur the cost of raising t further and achieving $\widehat{p}^{wE}$.[15] Therefore, the world price resulting from an SCM challenge is greater than $\widehat{p}^{wE}$, which indicates that the foreign government can gain from the SCM challenge and that the specific efficient outcome cannot be implemented by the stage-1 tariff negotiation ($\widehat{\tau} = \widehat{\tau}^E, \widehat{\tau}^* = \tau^{*E}$). This finding shows that there exists a range of outcomes on the efficiency frontier that cannot be implemented under the SCM restriction on subsidies; the restriction $s = 1$, by limiting the redundancy of policy instruments, constrains governments from achieving some efficient outcomes through tariff negotiations.

Bagwell and Staiger (2006) further consider a limited-instrument setting in which a tariff and a domestic production subsidy are available instruments (i.e., $t \equiv 1$), and show that there exist conditions under which the SCM agreement is an improvement on the GATT subsidy rules: under the limited-instrument environment, if a non-violation claim is costly, then no point on the efficiency frontier can be achieved by tariff negotiations, and if there is no corrective role for a domestic production subsidy, then any efficient outcome can be achieved under the SCM restriction on subsidies. In general, however, there are market failure and redistributive motives that call for an important role for domestic production subsidies. Bagwell and Staiger argue that, if governments consider domestic subsidies to be a vital policy instrument, then they may be hesitant to undertake tariff negotiations, since their subsidies may be the target of an SCM challenge under tariff commitments. The SCM agreement may thus have a chilling effect on tariff negotiations. In particular, Bagwell and Staiger show that, if the role of production subsidies on the efficiency frontier is sufficiently important, then the SCM restriction will locate the tariff-only efficiency frontier below the Nash point and make a tariff agreement impossible.

3 Domestic Subsidies and Deep Integration

The terms-of-trade theory of trade agreements shows that the GATT/WTO is well designed to minimize the terms-of-trade effect on the policy choices of member governments. Empirical evidence appears to support the relevance of this view.[16] As stated above, in regard to the treatment of domestic subsidies, the existing terms-of-trade theory offers

[15] For more discussion about the setting that leads to this finding, see Section III of Bagwell and Staiger (2006).

[16] For the related empirical literature, see Bagwell and Staiger (2011), Broda, Limao and Weinstein (2008) and Ludema and Mayda (2013).

an efficiency foundation of a shallow-integration approach and shows that international efficiency can be achieved by negotiations on tariffs alone under a market-access preservation rule. In fact, the flexibility provided by the GATT subsidy rules plays an important role for international efficiency to be achieved by a shallow-integration approach. In Bagwell and Staiger (2001), the efficiency frontier can be achieved by negotiations on tariffs alone when the home government is granted the flexibility to readjust its tariff unilaterally to secure market access at the negotiated level.[17] In Bagwell and Staiger (2006), the redundancy of policy instruments ensures that the home government, bound by the tariff commitment, has the flexibility to reposition its domestic policies while causing no disruption to domestic efficiency and to the foreign country's market access. Evidently, the WTO's restriction on domestic subsidies is not well received by the existing terms-of-trade theory. On the other hand, it is observed that recent preferential trade agreements (PTAs) go beyond eliminating tariffs on a preferential basis and include commitments of behind-the-border policies. Against the backdrop of the SCM agreement and PTAs, a recent literature attempts to offer a rationale for trade agreements to take a deep-integration approach to domestic policies. In this section, we summarize the literature in this line of research.[18]

3.1 Private Information and Domestic Subsidies

In this subsection, we argue that, in the presence of private information, a deep-integration approach to domestic subsidies may improve international welfare beyond the level attained by a shallow-integration approach. We follow Lee (2016) and consider a trade-agreement model that is similar to the basic partial-equilibrium model presented above with the new ingredient: a domestic production subsidy is a legitimate instrument with which to address a market imperfection that leads to under-production in the import-competing sector, but a government cannot determine whether its trading partner uses its domestic subsidy for legitimate or protective purpose. This ingredient is formally contained by assuming that the home government has private information about its externality type θ and thus about the magnitude of a legitimate subsidy with which to internalize the affected margin. It is assumed that a continuum of possible externality types is drawn from an interval $[0, \overline{\theta}]$ according to the differentiable distribution function

[17] Bagwell, Mavroidis and Staiger (2002) propose a modification to GATT rules of renegotiation that would provide a government with the necessary flexibility to raise its tariff unilaterally to secure market access at the negotiated level when it tightens the domestic standard that would grant greater market access.

[18] Ederington (2010) reviews the related literature that analyzes whether the scope of trade negotiations should be expanded to include domestic policies, such as labor and environmental standards.

$F(\theta)$ and the density $F'(\theta)$ which is positive everywhere.[19]

The source of the difficulty in finding a proper treatment of domestic subsidies is not just that a domestic subsidy may be used as a legitimate instrument to address market imperfection and as a protection instrument to circumvent tariff liberalization, but also that these two purposes are not clearly distinguished. Sykes (2005, 2010) argues that the problem with the WTO's restriction on domestic subsidies arises mainly from the difficulties of determining which domestic subsidies are used as undesirable protective measures; without such difficulties, restrictions on domestic subsidies might be negotiated to target only the protective use of subsidies.[20] Bagwell, Bown and Staiger (forthcoming) also state that, at a practical level, non-violation rules have their own limitations, because it may not be obvious what a government should reasonably expect at the time of negotiation and it also may not be clear where to draw the line in terms of which sorts of domestic policy changes are appropriately disciplined using non-violation complaints. In the context of the basic model presented above, if the externality type θ is uncertain at the time of negotiation, then a trade agreement, to achieve international efficiency, needs a state-contingent market-preservation rule and a free-trade commitment, which however is impossible to implement since the home government then has incentive to overstate the magnitude of θ and raise its domestic subsidy beyond the efficient level.

3.1.1 Costly Domestic Efficiency

A central concern about the SCM agreement is that a government under the SCM restriction may not be able to position its domestic subsidy to an efficient level. Indeed, domestic efficiency is an essential consideration for a proper treatment of domestic subsidies. Lee (2016) argues, however, that domestic efficiency is costly to achieve because a state-contingent use of domestic subsidies allows high import tariffs and thus reduces market access. A key idea is that, in the presence of private information, allowing high tariffs plays the role of providing the home government with "information rents" for domestic efficiency to be incentive compatible: given a state-contingent subsidy interval, if the government were not allowed to raise tariffs, then it would overstate its type and raise the subsidy beyond the efficient level. Lee shows that a market-access preservation rule, although it works well to promote domestic efficiency, leads to a suboptimal outcome: an

[19] Following the basic partial-equilibrium model, we assume that the external-value function is linear, θQ, whereas this function is nonlinear in Lee (2016).

[20] The non-violation complaints of GATT rules proved difficult to carry out perhaps due to the difficulties of determining the trade effects of domestic policy changes. From 1947 through 1995 only 14 out of the more than 250 Article XXIII proceedings focused on such complaints (Petersmann, 1997). Staiger and Sykes (2015) argue that this paucity of GATT/WTO rulings on non-violation complaints and their limited success do not undermine the importance of non-violation complaints.

optimal agreement constrains domestic efficiency and expands market access beyond the level achieved by a market-access preservation rule.

Lee (2016) considers the stage game: (i) two governments write an agreement that specifies a set of policy mixes and (ii) the home government observes its externality type and selects its policies from the policy set. The home government has a finite choice set $\{s \mid s : [0, \overline{\theta}] \to \mathbb{R}_+\} \times \{\tau \mid \tau : [0, \overline{\theta}] \to \mathbb{R}_+\}$, and a typical policy mix selected by the government with type θ is denoted by $(s(\theta), \tau(\theta))$. The objective of signing an agreement is to write the policy set that is incentive compatible and maximizes the expected global welfare. A policy set is incentive compatible if the home government with one externality type cannot gain from selecting a policy mix that is prescribed for this government when it has a different externality type. Let $(s(\theta), \tau(\theta))$ denote the policy mix selected by type θ under a policy set $\{(s, \tau) \in \mathbb{R}^2_+\}$, and let $(\widetilde{s}(\theta), \widetilde{\tau}(\theta))$ denote the policy mix selected by type θ under an alternative policy set $\{(\widetilde{s}, \widetilde{\tau}) \in \mathbb{R}^2_+\}$. An agreement is optimal if the policy set $\{(s, \tau) \in \mathbb{R}^2_+\}$ is incentive compatible,

$$W(s(\theta), \tau(\theta); \theta) \geq W(s(\widehat{\theta}), \tau(\widehat{\theta}); \theta) \text{ for all } \theta \text{ and } \widehat{\theta} \neq \theta, \qquad \text{(IC-}(s, \tau)\text{)}$$

and the policy set generates at least as high expected global welfare as any other incentive-compatible policy set $\{(\widetilde{s}, \widetilde{\tau}) \in \mathbb{R}^2_+\}$,

$$\int_0^{\overline{\theta}} W^G(s(\theta), \tau(\theta); \theta) dF(\theta) \geq \int_0^{\overline{\theta}} W^G(\widetilde{s}(\theta), \widetilde{\tau}(\theta); \theta) dF(\theta)$$

where

$$W(\widetilde{s}(\theta), \widetilde{\tau}(\theta); \theta) \geq W(\widetilde{s}(\widehat{\theta}), \widetilde{\tau}(\widehat{\theta}); \theta) \text{ for all } \theta \text{ and } \widehat{\theta} \neq \theta. \qquad \text{(IC-}(\widetilde{s}, \widetilde{\tau})\text{)}$$

Equivalently, an agreement is suboptimal if there exists an alternative incentive-compatible policy set that generates a higher expected global welfare.[21]

Lee (2016) associates an agreement that keeps a market-access preservation rule with an agreement in which the home government is granted the flexibility to select policies as long as it preserves the world price at a constant level.[22] The analysis begins by considering a hypothetical agreement that has the policy set

$$\{(s, \tau) : \widehat{p}^w(s, \tau) = \widehat{p}^w(\overline{\theta}, 0)\}, \qquad (24)$$

[21] The non-cooperative (Nash) policies remain the same as in (15) and satisfy incentive compatibility for all θ. The participation constraint is thus ensured by the optimality criterion.

[22] Our analysis here aims to show that it is costly to achieve domestic efficiency for all θ. For formal proofs of related discussions presented below, see subsection 2.4 in Lee (2016).

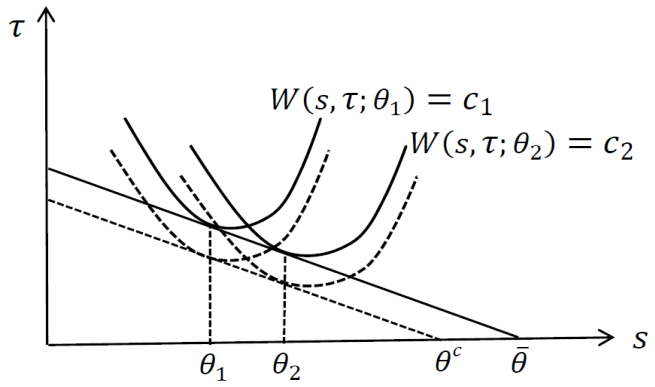

Figure 1: Pigouvian subsidies on iso-world-price functions.

under the assumption that there is no Nash policy mix in the policy set (24).[23] This policy set (24) is a strictly decreasing iso-world-price function with the slope

$$\left.\frac{d\tau}{ds}\right|_{d\widehat{p}^w=0} = -\frac{\partial\widehat{p}^w/\partial s}{\partial\widehat{p}^w/\partial\tau} = \frac{Q'}{D'-Q'} < 0,$$

and the home government under the policy set has the flexibility to select any policy mix as long as it preserves the world price at $\widehat{p}^w(\overline{\theta},0)$. Then, as Figure 1 portrays the policy choice made by the home government under the policy set (24) when demand and supply functions are linear, the government with type θ selects the Pigouvian subsidy, $s=\theta$, and the tariff τ that satisfies the constraint, $\widehat{p}^w(\theta,\tau)=\widehat{p}^w(\overline{\theta},0)$. In other words, the iso-world-price function (24) performs an incentive-compatible mechanism for domestic efficiency: an iso-welfare function, $W(s,\tau;\theta)=c$ for a constant c, is tangent to the function at $s=\theta$, and for all θ, the government truthfully selects Pigouvian subsidies along the function. To understand how an increase in θ affects the government's choice under the set (24), suppose that a policy point $(\widehat{s},\widehat{\tau})$ is selected by the government with $\widehat{\theta}$ and so $\widehat{s}=\widehat{\theta}$. Then an increase in θ makes the slope of the iso-welfare function $W(s,\tau;\theta)=W(\widehat{s},\widehat{\tau};\theta)$, $\frac{d\tau}{ds}=-\frac{\partial W(s,\tau;\theta)/\partial s}{\partial W(s,\tau;\theta)/\partial\tau}$, strictly steeper at the point $(\widehat{s},\widehat{\tau})$ where the iso-welfare function is tangent to the policy set (24),

$$\left.\frac{\partial}{\partial\theta}\frac{d\tau}{ds}\right|_{\theta=\widehat{\theta}} = -\frac{\frac{\partial Q(\widehat{s},\widehat{\tau})}{\partial s}\frac{\partial W(\widehat{s},\widehat{\tau};\widehat{\theta})}{\partial\tau} - \frac{\partial Q(\widehat{s},\widehat{\tau})}{\partial\tau}\frac{\partial W(\widehat{s},\widehat{\tau};\widehat{\theta})}{\partial s}}{(\partial W(\widehat{s},\widehat{\tau};\widehat{\theta})/\partial\tau)^2} < 0,$$

which means that an increase in θ generates robust forces of increasing subsidies along

[23] Since a decrease in s or τ raises the world price, the assumption means that, for each Pigouvian subsidy $s=\theta$, the Nash tariff is sufficiently high. In the large-country model, this assumption holds if $\overline{\theta}$ is below a certain level.

the set (24).[24] At a more general level, the iso-welfare function, $W(s,\tau;\theta)=c$, has the single-crossing property: for the policy region below the Nash policies, if $\theta_2>\theta_1$, then the iso-welfare function for θ_2 crosses the iso-welfare function for θ_1 from above only once. This property arises from two ingredients of the model: (i) the government with higher θ places a higher value on domestic production and (ii) the subsidy is more effective than the tariff to increase domestic production, $\frac{\partial Q}{\partial s}>\frac{\partial Q}{\partial \tau}>0$.

Lee (2016) presents three findings to formalize the argument that it is costly to achieve domestic efficiency for all θ. First, among the policy sets that entail the use of fully Pigouvian subsidies, $s=\theta$ for all θ, the policy set in which the world price is higher is superior to the policy set in which the world price is lower. If the iso-world-price function shifts up (and so the world price becomes lower), then the home government with type θ raises its tariff τ and keeps the same subsidy $s=\theta$, which decreases the global welfare $W^G(\theta,\tau;\theta)$.[25] Second, among the policy sets that entail the use of fully Pigouvian subsidies, the policy set (24) is optimal. The policy sets that entail the use of fully Pigouvian subsidies must be iso-world-price functions located in the region $\{(s,\tau):\widehat{p}^w(s,\tau)\leq\widehat{p}^w(\overline{\theta},0)\}$, and the policy set (24) entails the highest world price among them. Third, this policy set (24) is inferior to an alternative policy set,

$$\{(s,\tau):\widehat{p}^w(s,\tau)=\widehat{p}^w(\theta^c,0)\text{ for }\theta^c\in(0,\overline{\theta})\},\tag{25}$$

which preserves the world price at a higher level, $\widehat{p}^w(\theta^c,0)>\widehat{p}^w(\overline{\theta},0)$.

Figure 1 illustrates Pigouvian subsidies selected by types below θ^c under two policy sets (24) and (25). Under (25), the home government with $\theta<\theta^c$ selects Pigouvian subsidies with reduced tariffs and the government with $\theta\in[\theta^c,\overline{\theta}]$ pools at the policy mix $(\theta^c,0)$. A decrease in θ^c generates the global-welfare gain for $\theta<\theta^c$ associated with the reduced tariffs and the global-welfare loss for $\theta\in(\theta^c,\overline{\theta}]$ associated with the pooling at $(\theta^c,0)$. If θ^c decreases slightly from $\overline{\theta}$, then the marginal global-welfare loss for $\theta\in(\theta^c,\overline{\theta}]$ approaches zero since the pooling point $(\theta^c,0)$ is sufficiently close to the first-best policy mix $(\theta,0)$ for $\theta\in(\theta^c,\overline{\theta}]$, whereas the marginal global-welfare gain for $\theta<\theta^c$ remains strictly positive. Thus, the iso-world-price function (24) can be improved by including a new pooling at the top (i.e., for the subinterval of θ adjoining $\overline{\theta}$) and raising the world price above the original level. The use of fully Pigouvian subsidies that remedies under-production distortion in all states actually results in the home government becoming overly protective due to the

[24] We know that $\frac{\partial Q}{\partial s}>\frac{\partial Q}{\partial \tau}>0$ from the basic model above and that the iso-welfare function $W(s,\tau;\theta)=W(\widehat{s},\widehat{\tau};\theta)$ satisfies $\frac{\partial W(\widehat{s},\widehat{\tau};\widehat{\theta})}{\partial \tau}>\frac{\partial W(\widehat{s},\widehat{\tau};\widehat{\theta})}{\partial s}>0$ at the tangent point $(\widehat{s},\widehat{\tau})$, since the policy set (24) is a function with the slope $\left|\frac{d\tau}{ds}\right|=\left|\frac{Q'}{D'-Q'}\right|<1$.

[25] We know from (11) that $\frac{\partial W^G(s,\tau;\theta)}{\partial \tau}=\tau\frac{\partial M}{\partial \tau}<0$ when $s=\theta$.

accompanying high tariffs and additional domestic production.

3.1.2 Restriction on Domestic Efficiency

Lee (2016) proceeds to establish the suboptimality of keeping a market-access preservation rule: an optimal agreement constrains domestic efficiency and expands market access beyond the level achieved by an agreement that keeps a market-access preservation rule. This finding is presented in two steps. First, an optimal agreement restricts domestic efficiency at the top (for the subinterval of θ adjoining $\overline{\theta}$). A rigid (state-independent) use of subsidies at the top induces the home government to truthfully select zero tariffs at the top and reduced tariffs for lower types, since even under reduced tariffs, the government cannot raise subsidy above the rigid level. Second, an agreement is suboptimal if it includes an iso-world-price function as its policy subset and entails the use of Pigouvian subsidies in a subinterval of types.[26] This policy subset can always be shifted to reduce tariffs and raise the world price by allowing a new rigidity at the top of the subinterval. Lee shows that such a shift of the policy subset improves the expected global welfare due to the state-dependent substitutability between two policy instruments: for the same rigid policy mix (the same domestic production) at the top, the home government with a lower type is willing to accept a lower tariff and thus offer a greater level of market access.

A key implication of the finding is that an optimal agreement allows no such flexibility or discretion over subsidies implied by the GATT rules and that an optimal agreement uses a deep-integration approach to constrain domestic efficiency and expand market access beyond the level achieved by the market-access preservation rule.[27] The analysis is based on a fairly standard terms-of-trade setting in that international externality travels only through the terms of trade and equilibrium prices are determined by market-clearing conditions. The finding thus implies that the existing terms-of-trade theory's support for shallow integration may be weakened if a terms-of-trade model has an additional source of the inefficiency, private information, which requires the use of domestic subsidies to be

[26] Pigouvian subsidies are allowed only in separate points in an optimal agreement. For example, the policy set (25) is suboptimal since this iso-world-price function entails the use of Pigouvian subsidies in a subinterval $[0, \theta^c)$. Notice also that the model has no formal analysis for the case of import subsidies (i.e., $\tau < 0$). We can conjecture that an iso-world-price function that entails $\tau(\theta) < 0$ for all θ may be suboptimal since it can be shifted to reduce import subsidies by allowing a rigidity at the bottom (i.e., for the subinterval of θ adjoining 0), and that a policy set that includes an iso-world-price function as a policy subset with $\tau(\theta) > 0$ in a subinterval of θ is also suboptimal because of the second finding above.

[27] To gain some idea of why an optimal agreement needs deep integration, observe first that tariffs must be bound in an optimal agreement; with no constraints on tariffs, the home government would use the best instrument to capture terms-of-trade gains, the tariff. Now, given that tariffs are necessarily bound, with no constraints on domestic subsidies, domestic subsidies would be overly distorted since the government could then use an inferior instrument to capture the terms-of-trade gains, the domestic subsidy.

incentive compatible.

In a similar line of research, Bajona and Ederington (2012) adopt a self-enforcing trade-agreement model that has a different source of private information: domestic policies used by a country are unobservable to its trading partner and may thus be used without triggering punishment, since a government cannot tell whether an observed decrease in market access is due to domestic shocks or due to the use of domestic policies as hidden barriers.[28] Bajona and Ederington report two main findings. First, they show that an optimal self-enforcing agreement includes a tariff ceiling as an important component in addition to a market-access preservation rule, arguing that an agreement with a tariff ceiling, by inducing a deviating country to use an inferior instrument to reduce market access (the domestic policy), can reduce the incentive to deviate from the agreement. In particular, they identify a parameter region in which a trade agreement finds it optimal to allow domestic distortions for enforcement purpose as well as a parameter range in which domestic efficiency remains intact. Second, Bajona and Ederington consider the "linkage argument" found in Ederington (2002) and Limão (2005), and investigate whether a trade agreement can increase enforcement power by linking domestic policy to tariff negotiations and allowing cross-retaliation between policy instruments.[29] In the absence of transboundary non-pecuniary externalities, their model shows that the unobservability of domestic policy makes the cross-retalitation preferable in some parameter range, which means that the stronger threat of trade policy sanctions may be beneficial for hidden protective incentives to be held in check. Thus, these two findings of Bajona and Ederington suggest that the terms-of-trade theory's support for shallow integration can be at least partly weakened by the presence of private information. At the same time, they show that domestic efficiency may still remain intact despite the unobservability of domestic policy and that the parameter range of domestic distortions dissipates when governments become sufficiently patient and thus enforcement issue vanishes.

3.2 Commitment and Domestic Subsidies

In this subsection, we survey the literature that finds a rationale for the WTO's restriction on domestic subsidies in light of the commitment theory: as a commitment device that

[28] Domestic policy ("action") is privately observed in Bajona and Ederington (2012), whereas domestic policies publicly observable and the magnitude of a production externality ("type") is privately observed in Lee (2016).

[29] Apart from a private-information setting, Limão (2005) considers a self-enforcing trade-agreement model that allows for transboundary non-pecuniary externalities. Limão shows that a policy linkage can be used as a means of relaxing self-enforcement constraints and that governments can achieve higher welfare when policies are linked.

eliminates possible influences from ex post domestic lobbying, a government signs a trade agreement that constrains both tariffs and domestic subsidies. While the commitment theory is widely applied, the literature presented in this subsection examines how the commitment role of trade agreements relates to the SCM agreement in a small-country setting where the terms-of-trade arguments are absent.[30]

Maggi and Rodriguez-Clare (1998) argue that the commitment theory may offer an interpretation of the trade-agreement feature that looks puzzling from the terms-of-trade perspective. In broad terms, the commitment theory shows that a trade agreement can serve as a commitment device with which a government ties its hands ex ante and eliminates possible influences from ex post domestic lobbying. To formalize their argument, Maggi and Rodriguez-Clare (1998) extend the lobby model of Grossman and Helpman (1994) and include a stage in which resources are allocated across sectors, prior to the stage in which trade policy and political contributions are determined by Nash bargaining between the government and the lobby. In the commitment theory, the fundamental reason for a government to sign a trade agreement is that, whereas the government is compensated for the distortion generated by the trade-policy choice made under political influences for a given resource allocation, the government is not compensated for the ex ante distortion of resource allocation caused by the overinvestment made in the sectors where trade protection is anticipated. The government may thus be better off making an ex ante commitment to free trade and eliminating the lobby's anticipation of protection.

Brou and Ruta (2013) offer a rationale for the deep-integration feature of the SCM agreement in the light of the commitment theory. While considering a small-open economy and keeping the same fundamental reason for a government to sign a trade agreement as in Maggi and Rodriguez-Clare (1998), Brou and Ruta allow that a government has an import tariff and a domestic subsidy at its disposal. In their model, taxation to raise revenue and finance the production subsidy is distortionary, and each policy instrument generates a deadweight loss so that welfare is maximized by setting both instruments equal to zero. Brou and Ruta show that a tariff-only agreement that binds tariffs alone is subject to the "policy substitution problem": under political pressure of import-competing sectors, a government sets an inefficiently high domestic subsidy, thus undoing (at least partly) the welfare-increasing effect of tariff reduction. Their model thus expands the scope of commitment: the government prefers to sign a trade agreement that constrains both tariffs and domestic subsidies, since under a tariff-only commitment, the lobby can still influence the domestic-subsidy choice and cause the ex ante distortion of investments for which the government is not compensated.

[30] For a broader survey on the commitment theory, see Bagwell, Bown and Staiger (forthcoming) and Maggi (2014).

Brou and Ruta (2013) show that, under a nullification-or-impairment rule (i.e., a market-access preservation rule), a trade agreement can eliminate the policy substitution problem: the combination of a tariff binding and a nullification-or-impairment rule can effectively impose a cap on domestic subsidies and constrain the government from offering a new subsidy to import-competing sectors after the tariff ceiling is imposed. Moreover, Brou and Ruta find that there exists a remaining distortion even after the policy substitution problem is solved: the combination of a tariff binding and a nullification-or-impairment rule cannot fully eliminate the distortion of investments associated with the existing subsidy that is inefficiently high at the time of the tariff commitment. Observing that the serious prejudice rule can be invoked in cases where the subsidy was already in place at the time of the tariff negotiation, Brou and Ruta find that the serious prejudice rule, imposing a stricter constraint on domestic subsidies, can address the remaining distortion of investments in import-competing sectors under a tariff commitment. This finding thus supports the additional subsidy restriction imposed by the serious prejudice rule.[31]

3.3 Offshoring and Deep Integration

Antràs and Staiger (2012a, 2012b) ask the question of whether the GATT/WTO rules continue to be relevant in an environment where the offshoring of intermediate inputs is a prominent feature of international trade. Trade of intermediate inputs generates relation-specific investments and significant lock-in effects between buyers and sellers. In particular, Antràs and Staiger emphasize that the rise of offshoring may have changed the way that international prices are determined and thus changed the nature of the international externality that a trade agreement must address. In this subsection, we report their main finding: in the presence of offshoring, deep integration is needed to move governments from the Nash policies to the efficient policies, since governments typically distort domestic policy instruments for the terms-of-trade manipulation in the Nash policies. We also want to emphasize that this subsection makes the following significant simplifications to capture the main message at small cost. First, we follow Antràs and Staiger (2012b) and do not introduce an intermediate input. We assume that a domestic

[31] Maggi and Rodriguez-Clare (2007) develop a large-country model that captures two motives, the terms-of-trade and commitment motives for trade agreements, focusing on tariffs. Limão and Tovar (2011) consider a small-country model in which the government bargains with the lobby over two redistributive instruments, a tariff and a non-tariff barrier, where the tariff is more efficient redistributive instrument. Limão and Tovar show that the government can benefit from making a tariff commitment, since this commitment can improve its bargaining power relative to the lobby though it constrains the government's use of the more efficient redistributive tool. Their model abstracts from the possibility that commitments are extended to the non-tariff measure.

importer imports a specialized final good for sale on the domestic market. Second, while keeping the framework of our basic partial-equilibrium model, we use a consumption tax under the assumption that there is a negative consumption externality. The current setting offers a special case of offshoring that allows a simple derivation of the Nash and efficient policies, but it may extend for the use of other behind-the-border policies. Third, the offshoring model presented below heavily adopts Staiger's (2015) interpretation, since our basic partial-equilibrium model can be immediately modified to become a simplified version of his model that considers a complex policy environment.

3.3.1 The Basic offshoring Model

The offshoring model considered here is a simplified version of Staiger (2015) as stated above. The model assumes that the per-unit consumption of the import good, regardless of whether it is domestically produced or imported, generates a negative external value (e.g., per-unit pollution), and that the externality type is public information. The home government has two policy instruments, an import tariff τ and a consumption tax t. In the import-competing sector, there is a single domestic importer who acts like the dominant player, facing a competitive fringe of domestic suppliers, and there is also a single foreign exporter. The foreign exporter makes an ex ante investment for production of the good, and a hold-up problem is imbedded in the model: the foreign exporter and the domestic importer bargain over the international price at which the good is exchanged after the foreign exporter has already sunk the investment in production. The outside option has value 0: the exporter has no value of the good outside the domestic market and the importer has no alternative source of supply. The marginal cost of producing an additional unit of the good is constant and equals 1. Governments select their policies prior to the stage game: in stage 1, the foreign exporter produces the quantity x^* with the constant marginal cost 1; in stage 2, the foreign exporter and the domestic importer engage in symmetric Nash bargain over the price at which the good is exchange; and in stage 3, the domestic importer imports the quantity x^* at the price determined through the bargaining in stage 2, and the domestic importer sells x^* at the domestic market-clearing price.

To find the subgame perfect equilibrium, we begin by considering the domestic market clearing in stage 3. Given the quantity x^*, we use the relationship $p^d = p^s + t$ and have the market-clearing condition:

$$x^* = D(p^s + t) - Q(p^s), \tag{26}$$

where $Q(p^s)$ represents the domestic production by the competitive fringe. To simplify

notation, we define the RHS as $M(p^s, t) \equiv D(p^s + t) - Q(p^s)$ and have

$$M_1(p^s, t) = D'(p^s + t) - Q'(p^s) < 0 \text{ and } M_2(p^s, t) = D'(p^s + t) < 0.$$

The price $\widetilde{p}^s(x^*, t)$ is implicitly defined by the market-clearing condition (26) and it satisfies

$$\frac{\partial \widetilde{p}^s}{\partial x^*} = \frac{1}{M_1(\widetilde{p}^s, t)} < 0 \text{ and } \frac{\partial \widetilde{p}^s}{\partial t} = -\frac{M_2(\widetilde{p}^s, t)}{M_1(\widetilde{p}^s, t)} < 0.$$

We may consider two scenarios. First, the importer and exporter fail to reach agreement in stage 2, and their payoffs are zero. Second, the importer and exporter reach agreement in stage 2, and the importer can offer the quantity x^* for sale on the domestic market and make the revenue that amounts to $[\widetilde{p}^s(x^*, t) - \tau]x^*$. The symmetric Nash bargain in stage 2 equally splits the amount so that each receives the revenue $\frac{1}{2}[\widetilde{p}^s(x^*, t) - \tau]x^*$. Given x^*, the domestic importer has profits:

$$\pi = \frac{1}{2}[\widetilde{p}^s(x^*, t) - \tau]x^*.$$

Now in stage 1, the foreign exporter selects x^* that maximizes its profits

$$\pi^* = \frac{1}{2}[\widetilde{p}^s(x^*, t) - \tau]x^* - x^*,$$

and thus x^* satisfies the first-order condition:

$$\frac{1}{2}\left(\widetilde{p}^s(x^*, t) - \tau + \frac{x^*}{M_1(\widetilde{p}^s(x^*, t), t)}\right) - 1 = 0. \tag{27}$$

The term $\frac{x^*}{M_1(\widetilde{p}^s(x^*,t),t)} = \frac{\partial \widetilde{p}^s}{\partial x^*}x^*$ arises from the market power held by the foreign exporter, since the quantity x^* produced by the exporter affects the domestic price. We assume that $2M_1^2 - x^*M_{11} > 0$ holds for the second-order condition to be satisfied. In addition, we henceforth assume that the magnitude of the second derivatives, M_{11} and M_{12}, are sufficiently small. Then the quantity $\widehat{x}^*(t, \tau)$, produced by the foreign exporter in stage 1 and defined implicitly by (27), satisfies

$$\frac{\partial \widehat{x}^*}{\partial t} = \frac{M_1^2 M_2 - \widehat{x}^* \cdot M_{11}M_2 + \widehat{x}^* \cdot M_1 M_{12}}{2M_1^2 - \widehat{x}^* \cdot M_{11}} < 0 \text{ and} \tag{28}$$

$$\frac{\partial \widehat{x}^*}{\partial \tau} = \frac{M_1^3}{2M_1^2 - \widehat{x}^* \cdot M_{11}} < 0. \tag{29}$$

Plugging the quantity $\widehat{x}^*(t, \tau)$ into the price $\widetilde{p}^s(x^*, t)$, we can have the equilibrium domestic

prices as functions of policy instruments:

$$\widehat{p}^s(t,\tau) = \widetilde{p}^s(\widehat{x}^*(t,\tau),t) \text{ and } \widehat{p}^d(t,\tau) = \widehat{p}^s(t,\tau) + t. \tag{30}$$

We can then write profits in terms of policy instruments:

$$\begin{aligned} \pi(t,\tau) &= \frac{1}{2}[\widehat{p}^s(t,\tau) - \tau]\widehat{x}^*(t,\tau) \text{ and} \\ \pi^*(t,\tau) &= \frac{1}{2}[\widehat{p}^s(t,\tau) - \tau]\widehat{x}^*(t,\tau) - \widehat{x}^*(t,\tau). \end{aligned}$$

The home welfare consists of consumer surplus, producer surplus, revenue from the import tariff τ and the consumption tax t, and the negative consumption externality:

$$W(t,\tau;\theta) \equiv CS(\widehat{p}^d) + \Pi(\widehat{p}^s) + \tau \cdot \widehat{x}^*(t,\tau) + t \cdot D(\widehat{p}^d) - \theta \cdot D(\widehat{p}^d),$$

where $CS(\widehat{p}^d) \equiv \int_{\widehat{p}^d}^{\overline{p}} D(p)dp$ and $\Pi(\widehat{p}^s) \equiv \int_{\underline{p}}^{\widehat{p}^s} Q(p)dp + \pi(t,\tau)$. The home government's policy mix (t,τ) affects the foreign welfare: $W^*(t,\tau) \equiv \pi^*(t,\tau)$.

We now characterize the efficient policies that maximize the joint welfare $W(t,\tau;\theta) + W^*(t,\tau)$. The associated first-order conditions are solved by

$$t^E = \theta \text{ and } \tau^E = \frac{\widehat{x}^{*E}}{M_1(\widehat{p}^{sE},\theta)} - 1, \tag{31}$$

where $\widehat{x}^{*E}$ and $\widehat{p}^{sE}$ are evaluated at the efficient policies. In the efficient policies, the home government uses the Pigouvian tax with which to address the negative externality at the margin, and the government uses the tariff as subsidy in the amount $\frac{\widehat{x}^{*E}}{M_1(\widehat{p}^{sE},\theta)}$ to offset the term associated with the market power held by the foreign exporter and also subsidizes the marginal production cost of the foreign exporter. Consequently, we can observe from (27) that the efficient trade volume $\widehat{x}^{*E}$ is determined by the international productive efficiency: the marginal production cost of the domestic competitive fringe, represented by $\widetilde{p}^s(\widehat{x}^{*E}(\theta,\tau^E),\theta)$, is equal to the marginal cost of foreign production, 1.

We next characterize the Nash policies that maximize the home welfare $W(t,\tau;\theta)$. To simplify the characterization further, we follow Staiger (2015) and assume that the domestic competitive fringe has a linear supply function, $Q(p^s) = p^s$.[32] With this linearity,

[32] As we show below, the curvature of the demand function plays an important role in this simple model. As Staiger (2015) states, the curvature in this model is analogous to the curvature of the final-good production function in Antràs and Staiger (2012a).

we can rewrite (28) and (29) as

$$\frac{\partial \widehat{x}^*}{\partial t} = \frac{D' \cdot (D'-1)^2 - \widehat{x}^* \cdot D''}{2(D'-1)^2 - \widehat{x}^* \cdot D''} < 0 \text{ and } \frac{\partial \widehat{x}^*}{\partial \tau} = \frac{(D'-1)^3}{2(D'-1)^2 - \widehat{x}^* \cdot D''} < 0,$$

where inequalities hold under the assumption made above. Once we have $\frac{\partial \widehat{x}^*}{\partial t}$ and $\frac{\partial \widehat{x}^*}{\partial \tau}$, it is immediate to use the relationships in (30) and characterize how policy instruments affect those equilibrium domestic prices as well. The first-order conditions become

$$\begin{aligned} -\frac{1}{2}\widehat{x}^* \frac{\partial \widehat{p}^s}{\partial t} + \frac{1}{2}(\widehat{p}^s - \tau)\frac{\partial \widehat{x}^*}{\partial t} + \tau \frac{\partial \widehat{x}^*}{\partial t} + [t-\theta] \cdot D' \cdot \frac{\partial \widehat{p}^d}{\partial t} &= 0 \text{ and} \\ -\frac{1}{2}\widehat{x}^* \frac{\partial \widehat{p}^s}{\partial \tau} + \frac{1}{2}\widehat{x}^* + \frac{1}{2}(\widehat{p}^s - \tau)\frac{\partial \widehat{x}^*}{\partial \tau} + \tau \frac{\partial \widehat{x}^*}{\partial \tau} + [t-\theta] \cdot D' \cdot \frac{\partial \widehat{p}^d}{\partial \tau} &= 0. \end{aligned}$$

Plugging all related terms, we may derive the Nash policies that solve these two equations:

$$t^N = \theta + \frac{(\widehat{x}^{*N})^2 \cdot D''(\widehat{p}^{dN})}{2D'(\widehat{p}^{dN}) \cdot (D'(\widehat{p}^{dN}) - 1)^2} \text{ and } \tau^N = -\frac{\pi^N}{\widehat{x}^{*N}} - \frac{\widehat{x}^{*N}}{2(D'(\widehat{p}^{dN}) - 1)}, \tag{32}$$

where $\widehat{x}^{*N}$, $\widehat{p}^{dN}$ and π^N are evaluated at the Nash policies.

3.3.2 Domestic Distortion in Nash Policies

The comparison between (31) and (32) shows that the Nash policies do not achieve international efficiency. The Nash tariff is inefficiently high, $\tau^N > \tau^E$, which indicates that the home government has incentive to use its tariff and shift some incidence of this taxation to the foreign exporter.[33] A more remarkable finding is that the consumption tax may be (upwardly or downwardly) distorted from the Pigouvian level (depending on the curvature of demand function). Importantly, in the Nash policies, the home government has incentive to distort the domestic consumption tax from the efficient level. The intuition behind this result can be developed in two steps. First, there is a substitutability between two instruments when the equilibrium trade volume $\widehat{x}^*$ is held constant:

$$\left.\frac{d\tau}{dt}\right|_{d\widehat{x}^*=0} = -\frac{\partial \widehat{x}^*/\partial t}{\partial \widehat{x}^*/\partial \tau} = -\frac{D' \cdot (D'-1)^2 - \widehat{x}^* \cdot D''}{(D'-1)^3} < 0.$$

[33] Notice that the Nash tariff satisfies $\tau^N = -\frac{1}{2}(\widehat{p}^{sN} - \tau^N) - \frac{\widehat{x}^{*N}}{2(D'(\widehat{p}^{dN})-1)}$, where the term $-\frac{1}{2}(\widehat{p}^{sN} - \tau^N) = 1 - \frac{\widehat{x}^{*N}}{2(D'(\widehat{p}^{dN})-1)}$ as is implied by the equation (27). Therefore, we have $\tau^N = -1$ and hence $\tau^N > \tau^E$. Notice also that τ^N is lower when the per-unit importer's profit, $\frac{\pi^N}{\widehat{x}^{*N}}$, is higher and that τ^N is higher when the term associated with the the foreign exporter' market power, $-\frac{\widehat{x}^{*N}}{2(D'(\widehat{p}^{dN})-1)}$, is larger.

Second, the home government can reduce the foreign exporter's profits and convert this loss to the home-welfare gain by distorting the domestic consumption tax from the efficient level and adjusting the tariff to keep the trade volume $\widehat{x}^*$ constant; we may denote the substitutability of two instruments observed under $d\widehat{x}^* = 0$ as a decreasing function $\tau(t)$, and find that

$$\frac{d\pi^*(t,\tau(t))}{dt} = -\frac{(\widehat{x}^*)^2 \cdot D''}{2(D'-1)^3} \quad \text{and} \quad \left.\frac{dW(t,\tau(t);\theta)}{dt}\right|_{t=\theta} = \frac{(\widehat{x}^*)^2 \cdot D''}{2(D'-1)^3}.$$

In the current model, the terms-of-trade motivation may still be considered to be the cause of inefficiencies in the Nash policies. To see this, we may define the international price (i.e., the world price) as the untaxed price negotiated in stage 2 for the exchange between the foreign exporter and the domestic importer. In the model, this world price is given by $\widehat{p}^w = \frac{\pi^*}{\widehat{x}^*} + 1$, which can be written as

$$\widehat{p}^w = \frac{1}{2}[\widehat{p}^s(t,\tau) - \tau] \equiv \widehat{p}^w(t,\tau).$$

Given that the foreign exporter's profit in equilibrium now becomes

$$\pi^*(t,\tau) = [\widehat{p}^w(t,\tau) - 1]\widehat{x}^*,$$

if the home government reduces the foreign profits by distorting the domestic consumption tax while keeping the import volume $\widehat{x}^*$ constant, then it actually lowers the world price $\widehat{p}^w(t,\tau)$. This result means that the tariff is no longer the first-best instrument for terms-of-trade manipulations in this offshoring model. This finding may be presented at a more general level: in the presence of offshoring where international prices are determined by bilateral bargaining between domestic importers and foreign exporters rather than market-clearing conditions, governments typically distort domestic policy instruments for the terms-of-trade manipulation in the non-cooperative policies; therefore, a trade agreement must take a deep-integration approach to move governments from the Nash policies to the efficient policies.[34]

3.4 More Rationales for Deep Integration

In this subsection, we report two additional papers that find the desirability of deep integration from factors other than private information, commitment or offshoring. Sauré

[34] In contrast with the prediction by the corresponding terms-of-trade model, Antràs and Staiger (2012a) further show that, in the presence of offshoring, political economy motivations introduce additional policy distortions which a trade agreement can solve.

(2014) finds a rationale for deep integration using a self-enforcing agreement when each government has an import tariff and a generic domestic policy at its disposal. This generic domestic policy allows for a n-dimensional vector of domestic policies that may include domestic subsidies. Sauré argues that intertemporal persistence in economic conditions and its interaction with defection incentives can constrain the enforceability of a terms-of-trade commitment. In the model, a country's production possibilities are intertemporally linked so that its past policies are bound to determine current production possibilities and outcomes; in particular, the model allows that the home country's current state variable that represents its productivity and labor and capital stock is determined by the previous-period home and foreign countries' policies and state variables. In a terms-of-trade commitment, a country is granted the flexibility to select any policy mix that preserves the negotiated terms of trade. Thus, in the presence of intertemporal linkages, the country, by changing its policy mix while keeping the negotiated terms of trade, can affect its future production possibilities and manipulate its own defection incentives. Sauré shows that the self-enforceable set of policies that avoid defection incentives is larger in a policy-mix agreement than in a terms-of-trade commitment. This finding thus supports a deep-integration approach showing that, under persistent economic conditions, governments can increase the enforceability of their trade agreements by including tariffs and domestic policies directly.

Regarding the WTO/GATT as a highly incomplete contract, Horn, Maggi and Staiger (2010) develop a trade-agreement model in which each government uses an import tariff and a domestic production subsidy, and argue that the contract form selected under contracting costs can offer rich predictions on core features of the WTO/GATT.[35] Among the broad themes discussed in their paper, Horn, Maggi and Staiger show that an incomplete-contract perspective can explain why the GATT binds tariffs whereas it largely leaves domestic policies to the discretion of governments and why the treatment of domestic subsidies has evolved. They suggest that an increase in trade volume over time may provide an explanation of why the WTO has introduced additional discipline in the use of domestic subsidies that was not present under the GATT. In the model, the costs of leaving the use of domestic subsidies to discretion take the form of domestic distortions driven by the term-of-trade manipulation. An increase in trade volume thus raises the costs of discretion and heightens the need to constrain the use of domestic subsidies in the contract.

[35] The model also allows for a domestic consumption tax when it discusses the role of the National Treatment clause that constrains the relationship between taxes on the consumption of domestically produced and imported goods.

3.5 Further Discussions

The WTO/GATT approach to the treatment of domestic subsidies has evolved greatly over time from its primary reliance on non-violation claims in the early GATT rules to the more explicit legal provisions of the SCM agreement. The legal environment prior to the Uruguay Round was fairly tolerant to the use of domestic subsidies: under the GATT subsidy rules, new or increased subsidies could be challenged, but only if they upset the legitimate expectations of market access associated with tariff negotiations. This historical perspective raises the question of why the WTO/GATT treatment of domestic subsidies has developed in this way from the market-access focus to more explicit contractual commitments. It looks evident that the SCM agreement aims to strengthen GATT subsidy disciplines on the premise that subsidization causes distortions in the world trading system, but the SCM agreement does not contain a preamble or an explicit statement of its objective and purpose. The answer to the question, although it remains largely as an open question in the existing literature, may depend on how the problems that trade agreements are supposed to fix have changed over time.

The terms-of-trade theory of trade agreements shows that the inefficiency that a trade agreement must primarily correct to move governments from the Nash (non-cooperative) policies boils down to a single source: the Nash tariff is too high and the market-access level is too low. In a similar vein, the private-information models of Bajona and Edering-ton (2012) and Lee (2016) also perceive the terms-of-trade externality as the underlying problem posed to a trade agreement, and report that the tariff is the only inefficient instrument in the Nash policies. This finding is not surprising, because those models have the standard feature of terms-of-trade models: international externality travels only through the terms of trade, and local and world prices are determined by market-clearing conditions. Thus, regardless of whether governments have private information, the terms-of-trade models generally show that domestic policies are set efficiently in the Nash policies and that countries have incentive to distort domestic subsidies only when they are constrained in the use of the efficient instrument of the term-of-trade manipulation, the tariff.

The question is whether tariff negotiations are sufficient for international welfare to be maximized under the regulatory environment that secures market access against subsequent erosion. The terms-of-trade models show that, if there is an additional source of inefficiency, private information, then the combination of a tariff binding and a market-access preservation rule may leave rooms for international welfare to be further improved through deep integration. Thus, although the terms-of-trade literature has not fully developed to provide a rationale for why the WTO/GATT system has evolved from the

market-access focus to the SCM agreement, it suggests that a deep-integration feature of trade agreements may generate additional benefits: in the presence of private information, countries can increase the value of international cooperation beyond the level achieved under the GATT rules by bringing domestic subsidies openly to the negotiation table and agreeing to impose restrictions on the use of domestic subsidies. At the same time, however, the simplicity of a market-access preservation rule raises the question of whether a deep-integration design can generate a measurable improvement of international welfare after taking administrative costs of acquiring knowledge for possibly complicated contractual design into account. We can conjecture that governments might optimally determine the depth of integration and the complexity of contractual design in their negotiations.

In the light of the commitment theory, a small-country model of Brou and Ruta (2013) shows that the deep-integration feature of the SCM agreement can eliminate a remaining distortion that may persist even after policy substitution problem is solved under the combination of a tariff binding and a market-access preservation rule. Maggi and Rodriguez-Clare (2007) develop a large-country version of the commitment theory that allows for the terms-of-trade and commitment motives for trade agreements. Among their other results, they show that the two motives are manifested in two phases of tariff reduction: an immediate tariff reduction which is due to the terms-of-trade motives and a subsequent gradual tariff reduction which reflects the commitment motives. Intuitively, the commitment motives call for bigger tariff reductions in the long run than in the short run since the allocation distortions caused by protection are more severe in the long run than in the short run. Maggi and Rodriguez-Clare (2007) consider only tariffs. Referring to the affinity for deep integration shown in Brou and Ruta (2013), Bagwell, Bown and Staiger (forthcoming) suggest a potential hybrid of the two models for the conjecture that the desirability of deep integration may be phase-dependent and arise from the second-phase commitment motives.

From an incomplete-contract perspective, Horn, Maggi and Staiger (2010) suggest that an increase in trade volume over time may explain the evolution in the treatment of domestic subsidies: an increase in trade volume changes the contractual environment in favor of constraining the use of domestic subsidies since it raises the incentive to distort subsidies for the terms-of-trade purposes, whereas leaving domestic subsidies out of the contract is an attractive way to save on contracting costs if the country trades little (or if the country has little monopoly power in trade, or if domestic subsidy is a poor substitute for tariff as a tool of the terms-of-trade manipulation). While offering an explanation of why trade volume increases over time is not the subject of their paper, they suggest that a change in trade volume and in the associated magnitude of the terms-of-trade motivation should be an environmental factor that determines whether the optimal contract takes a

shallow or deep integration form.

The existing trade-agreement models that support deep integration have a common ingredient: distortions in domestic policies exist in a certain stage when a trade agreement moves governments from the non-cooperative policies to the most cooperative policies. In the terms-of-trade models, domestic distortions are considered to be an issue that arises subsequent to tariff reductions. Regardless of whether governments have private information, the policy tools used for the terms-of-trade manipulation are rather simple in those models: tariffs in the non-cooperative policies and then domestic policies under tariff commitments. In a different strand of literature, domestic distortions are considered to be an old issue that originates from the non-cooperative policies. In the presence of offshoring, the tariff is no longer the best tool for the terms-of-trade manipulation and domestic policies are typically distorted in the non-cooperative policies. The commitment theory shows that governments may use deep integration as an extended commitment device to eliminate the investment distortion resulting from the inefficient subsidy present at the time of tariff commitments. At a general level, in political-economy models where the trade intervention of governments emerges in political equilibrium due to the lobby's influence, it is not unusual that the non-cooperative policies contain domestic distortions other than excessive tariffs, since domestic subsidy is more efficient instrument than tariff to reallocate income across interest groups in many political-economy models.[36]

The existing trade-agreement models hold differing views on domestic efficiency even when their findings commonly support deep integration. A critical question is whether domestic efficiency is supposed to be intact or inevitably restricted to improve international welfare. In those models where domestic policies are distorted in the non-cooperative policies, the rationale for deep integration is based on the domestic distortions that a trade agreement must eliminate from the non-cooperative policies for the efficiency frontier to be achieved. In the terms-of-trade models with private information discussed above, the rationale for deep integration hinges on the restriction on domestic efficiency that a trade agreement must impose for the international objective of expanding market access.

4 Prohibition of Export Subsidies

In this section, we review the literature that analyzes the second regulatory features of the SCM agreement stated above: the general prohibition of export subsidies. It appears reasonable that the use of export subsidies may distort international markets and cause

[36]Rodrik (1995) provides reasons of why intervention in trade policy, an inferior tool of income redistribution, exists in political equilibrium.

inefficient patterns of trade, and thus it should be restricted by the world trading system. At a theoretical level, however, it is quite difficult to justify the prohibition of export subsidies given the trade-volume-expanding nature of export subsidies. In particular, the prohibition on export subsidies is puzzling from the terms-of-trade perspective. For a concrete example, consider a 2-good 2-country partial-equilibrium setting in which markets are perfectly competitive. Suppose that the home country offers an export subsidy in its export sector. The export subsidy s^e generates a wedge between the local price and the world price of the export good,

$$p^l = p^w + s^e, \tag{33}$$

where the local price p^l equals the local consumer and seller prices in the exporting (home) country, $p^l = p^d = p^s$, under no further policy intervention. The equilibrium world price of the export good $\widehat{p}^w$ is determined by the market-clearing condition,

$$Q(p^l) - D(p^l) = D^*(p^w) - Q^*(p^w), \tag{34}$$

and the equilibrium local price of the export good is given by $\widehat{p}^l = \widehat{p}^w + s^e$. Using (33) and (34), we can find that an increase in the export subsidy s^e lowers the world price and thus causes a decline in the home country's terms of trade, while it raises the local price:

$$\frac{d\widehat{p}^w}{ds^e} = -\frac{Q' - D'}{Q' - D' - (D^{*\prime} - Q^{*\prime})} < 0 \text{ and} \tag{35}$$

$$\frac{d\widehat{p}^l}{ds^e} = -\frac{D^{*\prime} - Q^{*\prime}}{Q' - D' - (D^{*\prime} - Q^{*\prime})} > 0. \tag{36}$$

On the other hand, if the home country increases the export subsidy, then its trading partner, the importing (foreign) country, enjoys a positive terms-of-trade externality; an increase in s^e lowers the world price as seen in (35), which in turn increases the sum of the foreign consumer and producer surplus. Notice that this positive effect of the increase in s^e on the foreign welfare is analogous to the positive terms-of-trade effect that the foreign country would enjoy under the scenario where the home country reduces the tariff imposed on its import good. It is thus often argued that the importing country would benefit from subsidized imports and its best response would be to "send a thank you note" to the subsidizing country that exports the good.[37]

[37] From (35) and (36), it can also be argued that no retaliation from the importing country is needed since an increase in the export subsidy reduces the welfare of the exporting country. Notice also that the strict restriction on export subsidies is puzzling in the classical third-market model of Brander and Spencer (1985) where two exporting producers located in two different countries compete for sales in the third-country market where all consumers are located. Observing that an increase in export subsidies has a positive terms-of-trade externality to importing consumers and that this positive effect is taken into

A recent literature attempts to establish two findings. First, if import tariffs are sufficiently low, then trade agreements impose restrictions on the use of export subsidies for more efficient outcomes. Second, if import tariffs are sufficiently high, then trade agreements focus on reductions in tariffs, having no necessity of imposing restrictions on the use of export subsidies. In broad terms, the literature associates the first finding with the WTO's general prohibition of export subsidies and the second finding with the fact that early GATT rounds focused on reductions in import tariffs rather than reductions in export subsidies. For these findings, the literature considers two international externalities, a firm-delocation externality and a profit-shifting externality, that may arise in various imperfect competition models. The delocation models offer a long-run interpretation of trade policies given that the number of firms in each country is endogenously determined by free-entry condition. In these models, the cross-border externalities occur through a change in local prices and its impact on consumer surplus. The literature shows that the delocation externality can offer a rationale for restrictions on export subsidies in the linear Cournot model. In other imperfect-market structures, however, the prohibition of export subsidies is difficult to establish in the delocation setting. The profit-shifting models offer a relatively short-term analysis of trade policies given that firms in these models make positive profits for a fixed number of firms. The literature suggests that governments may have self-enforcement benefits by banning export subsidies and negotiating only import tariffs. The remaining question is whether the profit-shifting externality of unilateral policy choices can offer a rationale for the prohibition of export subsidies, other than self-enforcement considerations. The answer to this question is split in the literature and depends on whether the GATT-type market-access preservation rule is sufficient to prevent profit-shifting externalities from being transmitted across borders.

4.1 Firm-Delocation/Profit-Shifting Externality

Bagwell and Staiger (2012a) offer an interpretation of the restraint on export subsidies introduced by the SCM agreement. Bagwell and Staiger follow Venables (1985) and adopt a Cournot delocation model in which a homogeneous good is produced and consumed in both domestic and foreign countries. Assuming that demand and cost functions are linear, the model considers the 3-stage game: (i) governments select import and export tariffs; (ii) observing the trade costs implied by policy choices, potential entrants decide whether they locate in the domestic or foreign market; and (iii) given the number of firms located in each country, entering firms engage in Cournot competition. Notice that

account by efficient export policies, not by the non-cooperative policies, we may say that export subsidies are under-supplied in the non-cooperative policies.

their Cournot delocation model focuses on a long-run analysis of trade policies in that free entry eliminates profits in equilibrium and the number of firms in each country is endogenously determined. A central feature of the model is that a unilateral policy intervention generates a firm-delocation effect: a higher trade cost along one channel of trade increases the number of firms in the importing country and decreases the number of firms in the exporting country. Following Venables (1985), Bagwell and Staiger observe that a unilateral policy intervention imposes a firm-delocation externality on welfare through a Metzler paradox: starting at global free trade, an introduction of a small import tariff or a small export subsidy by the domestic country generates a welfare gain for the domestic country and a welfare loss for the foreign country, since it promotes domestic entry and foreign exit, so that the domestic price falls and the foreign price rises. They also establish that the efficiency frontier can be achieved by free trade (a net trade tax of zero along each channel of trade).[38]

Bagwell and Staiger (2012a) next consider a symmetric Nash equilibrium and show that the Nash equilibrium entails import tariffs and export taxes. Intuitively, in the presence of a significant import tariff, an export tax is more appealing than an export subsidy: an import tariff by the domestic government increases the cost of an export subsidy since it promotes domestic entry and thus increases export volume, whereas an export tax by the domestic government increases the revenue benefit of the import tariff since it promotes foreign entry and thus increases import volume. In the Nash equilibrium where an export tax is used in conjunction with an import tariff, a ceiling on export subsidies is therefore meaningless. However, if a tight ceiling on import tariffs is imposed, then a country is tempted to use an export subsidy. From this perspective, restrictions on export subsidies are expected only when import tariffs are sufficiently low. In this way, the linear Cournot delocation model offers an interpretation of the prohibition of export subsidies introduced by the SCM agreement.[39]

A firm-delocation externality is present also in monopolistic-competition models as shown in Venables (1987). Ossa (2011) adopts a monopolistic-competition model in which a unilateral trade policy generates a firm-delocation externality, and shows that the major

[38] For the per-unit transportation cost ϕ, the total trade cost imposed on foreign exports is $\tau = \phi + t_h + t_f$, where t_h is the (specific) import tariff imposed by the home government and t_f is the (specific) export tariff imposed by the foreign government. Similarly, the total trade cost imposed on home exports is $\tau^* = \phi + t_h^* + t_f^*$, where t_h^* is the (specific) domestic export tariff and t_f is the (specific) foreign import tariff. Bagwell and Staiger (2012a) show that the efficiency frontier can be achieved by a continuum of symmetric policies that deliver zero trade taxes along each channel of trade, $\tau = \tau^* = \phi$. Global free trade ($t_h = t_f = t_h^* = t_f^* = 0$) is thus efficient.

[39] Bagwell and Staiger (2012a) also show that, starting at an efficient point, if import tariffs were further lowered, then efficiency would be maintained if and only if export subsidies were also capped so as to maintain a total trade tax of zero.

design features of the GATT/WTO such as reciprocity and nondiscrimination can be sensibly interpreted as efficiency-enhancing principles that can make countries internalize the delocation externality and enjoy a monotonic welfare improvement in their multilateral trade negotiations. A natural question is then whether the delocation externality found in a long-run monopolistic-competition setting can offer a rationale for the prohibition of export subsidies. The literature indicates that the prohibition of export subsidies is difficult to establish in the setting. Ossa (2011) abstracts from export policies in his analysis. Bagwell and Staiger (2015) consider a monopolistic-competition delocation model in which governments have both import tariffs and export tax/subsidies at their disposal and consumers are assumed to have a quasi-linear utility that neglects income effects on the demand for differentiated products. Bagwell and Staiger show that the terms-of-trade externality alone accounts for the inefficiency of unilateral policy choices as it does in perfect competition settings: given the availability of both import tariffs and export tax/subsidies, if governments were not motivated by the terms-of-trade consequences of their trade policies, then the resulting politically optimal trade policies would be efficient. In contrast to the linear Cournot delocation model discussed above, their monopolistic-competition delocation model conveys the standard terms-of-trade perspective that the prohibition of export subsidies is puzzling given their trade-volume-expanding nature.

Bagwell and Lee (2015) analyze trade policies in a monopolistic-competition model with heterogeneous firms, adopting a symmetric, two-country version of Melitz-Ottaviano (2008) model. In the model, firms have zero expected profits under free entry and consumers have a preference for variety. Bagwell and Lee show that, starting at global free trade, a country gains from a unilateral introduction of (i) a small import tariff; (ii) a small export subsidy, if transportation costs are low and productivity dispersion is high; and (iii) a combined small increase in its import and export tariff. In this heterogeneous-firms model, all these three are beggar-thy-neighbor interventions: each intervention raises the critical cutoff cost level for sales in the foreign country, which in turn increases the average price and lowers consumer surplus in the foreign country. The export-subsidy finding in (ii) and its beggar-thy-neighbor nature imply that restrictions on export subsidies could be attractive once governments have achieved an outcome close to global free trade.[40] In

[40] In oligopoly models, for a given number of firms, if a domestic firm competes with a foreign firm in a third country, then it is typically optimal to tax (subsidize) exports under price (quantity) competition. Etro (2011) obtains the export-subsidy finding in an international market where firms from different countries compete in Nash policies: if entry in an international market is endogenous, then the optimal unilateral trade policy requires a positive export subsidy in both price and quantity competition. In the model, the only way for the domestic firm to earn positive profits is to adopt an aggressive strategy that increases market share and reduces average costs below those of the other firms; an accommodating strategy would attract entry and profits would vanish.

the Melitz-Ottaviano model, however, global free trade is not generally justifiable from the efficiency perspective, given that there is an entry-externality effect that may lead to excessive entry at free trade in the model.[41] Bagwell and Lee identify conditions under which the efficient symmetric trade policies entail a positive total tariff but below that in a symmetric Nash equilibrium. They in turn show that, starting at the symmetric Nash equilibrium, countries can mutually gain by exchanging small reductions in import tariffs, export tariffs, or import and export tariffs. This finding thus provides an explanation of why early GATT rounds focused on reductions in import tariffs rather than reductions in export subsidies. On the other hand, since global free trade is not generally efficient, restrictions on export subsidies implied by the export-subsidy finding are not as strongly supported in this monopolistic-competition model as in the linear Cournot model of Bagwell and Staiger (2012a).

Mrazova (2011) considers a Cournot-type model in which firms make positive profits under the assumption that the number of firms per country is fixed and invariant to trade policy and consumers have a taste for variety. In her model, a unilateral trade policy selected by the domestic government generates a terms-of-trade externality and a profit-shifting externality: (i) an increase in import tariffs improves the domestic country's terms of trade, and by promoting domestic output associated with the reduced market access, it shifts profits from foreign to domestic firms; and (ii) an increase in export subsidies deteriorates the domestic country's terms of trade, and by increasing the domestic export volume and thus decreasing foreign output, it shifts profits from foreign to domestic firms. A trade agreement is self-enforced in a repeated game, if the current welfare gain a deviating country would enjoy is lower than the future welfare loss the deviating country would suffer. Mrazova builds on the feature that the efficiency frontier can generally be achieved by import or export instrument alone, and takes consideration of self-enforcement to provide a rationale for banning export subsidies and negotiating only import tariffs: to achieve the efficiency frontier, a tariff-only agreement (with no export subsidies) can be more easily self-enforced than a subsidy-only agreement (with no import tariffs). For this finding, using the export-subsidy finding in (ii) that the profit-shifting motivation of export subsidies goes in the opposite direction to the terms-of-trade motivation, Mrazova establishes that the future welfare loss a deviating country would suffer in the punishment phase is greater in the tariff-only agreement than in the subsidy-only agreement and also that, in a wide range of parameters, the future loss is a dominant factor that determines which agreement is more self-enforceable.

The remaining question is whether the profit-shifting externality of unilateral pol-

[41] In the model, additional entry results in the consumer surplus from a new variety, the consumer loss on existing varieties, the benefit of an increase in the number of varieties, and a business-stealing effect.

icy choices can offer a rationale for the prohibition of export subsidies, other than self-enforcement considerations. The answer to this question is split in the literature and depends on whether the GATT-type market-access preservation rule is sufficient to prevent profit-shifting externalities from being transmitted across borders. Bagwell and Staiger (2012b) consider a sequence of trade models that feature profit-shifting externalities in various imperfectly competitive settings. In their models, governments have both import tariffs and export tax/subsidies available, and firms have market power under the assumption that the number of firms is fixed and invariant to trade policy. Bagwell and Staiger show that, although there exist profit-shifting externalities that travel through domestic and foreign local prices in their models, if governments did not value the terms-of-trade consequences of their trade policies, then unilateral trade policies would offer no first-order benefit to domestic welfare, and the resulting politically optimal trade policies would be efficient. Thus, as long as the availability of export tax/subsidies is not ruled out, the terms-of-trade externality alone continues to account for the inefficiency of unilateral policy choices in their models. Their profit-shifting models are again in line with the standard terms-of-trade perspective that the prohibition of export subsidies is puzzling given their trade-volume-expanding nature.

In regard to the remaining question, DeRemer (2013) asserts that the evolution of the GATT/WTO subsidy rules may be attributable to the profit-shifting externality rather than the terms-of-trade externality. DeRemer uses a monopolistic-competition structure and develops a profit-shifting model of trade agreement in which firms have market power and each government has a domestic entry subsidy available in addition to the trade policy instruments, an import tariff and an export subsidy.[42] A notable feature of the model is that the number of firms in each country is independent of local prices (and thus trade policies) but is influenced by the entry subsidy. The home export volume thus depends not only on foreign policies but also on the home entry subsidy. DeRemer finds that a change in subsidy policies generates cross-border externalities that a market-access preservation rule cannot neutralize: even under the market-access preservation constraint that preserves home exports, a small increase in the entry or export subsidy by the foreign government affects the home welfare, through the effects on domestic profits and consumer surplus and through the effect on tariff revenue that depends on tariff levels. Formally, DeRemer defines a GATT equilibrium as a set of policies that each government would unilaterally select under the market-access preservation constraint, and proceeds to

[42] While DeRemer (2013) includes a domestic subsidy as well as an export subsidy, the model is discussed in this subsection, given that both subsidies in the model have the export-promoting nature and may thus be subject to a countervailing measure when they cause injury in the trading partner's domestic industry.

identify a parameter range of government preference in which the negative profit-shifting effect of an increase in the entry or export subsidy is dominant in a GATT equilibrium. DeRemer presents two main findings and asserts that the profit-shifting externality can explain the evolution of the GATT/WTO subsidy rules. First, reductions in import tariffs are necessary for a GATT equilibrium to be improved by imposing limits (caps) on entry subsidies or export subsidies: the GATT equilibrium that has non-cooperative tariffs cannot be improved by subsidy limits, and thus subsidy limits matter only when tariffs are sufficiently low.[43] Second, there exists a parameter range in which a GATT equilibrium that has sufficiently low import tariffs can now be improved by imposing limits on subsidies.

4.2 Commitment Theory

The delocation and profit-shifting models have some success in providing a rationale for the prohibition of export subsidies. These models, however, do not explain the observed asymmetric treatment of export subsidies in the GATT/WTO: export subsidies are prohibited outright, but import tariffs are legal and bound by negotiations. A formal analysis of the asymmetric treatment of export subsidies is rare.

As noted above, the commitment theory offers an interpretation of the feature that looks puzzling from the terms-of-trade perspective. Maggi (2014) argues that the commitment theory may potentially be extended to explain the elimination of export subsidies: if export interests are formed in the non-cooperative equilibrium, then a government may commit to a trade agreement that reduces export subsidies relative to the non-cooperative level. Potipiti (2012) extends the small-open economy model of Maggi and Rodriguez-Clare (1998) and offers an explanation of the asymmetric treatment of import tariffs and export subsidies. In the Potipiti's model, a government can eliminate the anticipation of protection and achieve the efficient investment by signing a trade agreement that bans import tariffs and/or a trade agreement that bans export subsidies. When the government commits to an agreement, it must give up the political contributions that it would otherwise extract for the protection it provides. The government will thus sign an agreement if it can be better off making the commitment. Potipiti shows that the asymmetric treatment of import tariffs and export subsidies is primarily caused by an environment that differentially affects two sectors: as transportation costs decrease, export sectors grow and import-competing sectors decline.

[43] The model says that a GATT equilibrium that satisfies the market-access preservation constraint is improved by subsidy limits, if governments can achieve more efficient outcome with subsidy limits than without subsidy limits.

To formulate the asymmetric-treatment result from this environment, Potipiti (2012) keeps the original Nash-bargaining stage and includes a subsequent stage in which the rate of return on capital is asymmetrically determined across two sectors as transportation costs decrease. The asymmetric prospects of the subsequent capital return then generate the government's asymmetric valuation of two options: providing export subsidies and protecting import-competing sectors. In export sectors, the rate of return on capital grows. Export subsidies attract new entrants and investment, and these entrants erode the rents that the government could extract by providing export subsidies. Given that the government can collect small political contributions by providing export subsidies, Potipiti identifies a parameter range in which the government commits to an agreement that bans export subsidies. On the other hand, in import-competing sectors, the rate of return on capital drops and thus capital is sunk and cannot exit. By offering protection to these sectors, the government can raise the rate of return on capital to a moderate level to attract no new entry. The rents from protection are not eroded by new entrants and the government can collect large political contributions by protecting import-competing sectors. Finally, using the government's asymmetric valuation of two options, providing subsidies to growing export sectors and offering protection to declining import-competing sectors, Potipiti identifies a parameter range in which it is optimal for a government to prohibit export subsidies and allow import tariffs.[44]

4.3 Countervailing Measures

The SCM agreement includes two regulatory approaches to the use of export subsidies: it prohibits export subsidies, and at the same time, it permits importing countries to use CVDs and offset the injury caused by subsidized imports. We find that a recent literature concentrates on the prohibition of export subsidies while the literature on CVDs has remained small since the early papers of Dixit (1988) and Spencer (1988).[45] We also find that there is a small body of literature that considers the potential role of CVDs under the scenario that a domestic subsidy, offered to home exporting firms, causes injury to the foreign import sector and results in the foreign CVD claim.

As a starting point of our discussion, we consider a basic benchmark result: if CVDs are available with no delays or administrative costs, then an importing country cannot be hurt by a foreign export subsidy. The use of CVD restores the original local price,

[44] To be precise, Potipiti (2012) identifies a parameter range in which it is optimal for a government to sign an agreement that bans export subsidies and not to sign an agreement that bans import tariffs.

[45] Research on CVDs may be motivated by observing the available data on the uses of countervailing duties. Bown (2014) reports detailed information about the major users of countervailing duties (including tariff line product codes), in addition to antidumping and safeguards.

so that consumer and producer interests in the importing country are unaffected, and simply leaves the importing country with greater tariff revenue.[46] This benchmark argument leaves some important questions unanswered. Is the use of CVD tariffs an optimal response to an export subsidy? When do CVDs become less effective in deterring the use of export subsidies? Can CVDs play the role of directing governments to international efficiency?

Dixit (1988) examines how the home country's optimal countervailing policy changes in response to an exogenous foreign export subsidy in a Cournot-type model where home and foreign firms sell a homogeneous/heterogeneous good in the home market. Dixit provides some theoretical support for the use of countervailing tariffs, showing that the foreign export subsidy can be partially countervailed by the home government's optimal tariff.[47] Collie (1991) adopts a Cournot competition of home and foreign firms selling a homogeneous good in the home market and analyzes how the foreign country's optimal export policy changes in response to the home country's countervailing policy. Using a two-stage game in which the foreign country moves first and sets its export subsidy before the home country sets its countervailing policy, Collie shows that the home country's countervailing tariff can deter the foreign country's export subsidy; if the home country uses a tariff and a production subsidy, then the optimal foreign policy is an export subsidy, but if the home country uses a tariff only, then the optimal foreign policy is usually an export tax. While using a Cournot model as in Collie (1991), Qiu (1995) explains why the home country's countervailing tariff cannot deter the foreign country's export subsidy. Qiu shows that the home country's CVDs and the foreign country export subsidy may coexist in equilibrium when the effectiveness of CVDs is weakened by the factors such as delay in retaliation, the GATT constraint on the amount of CVDs and voluntary export restraints. Hartigan (1996) considers a two-period model of consumer switching costs for strategic substitutes and argues that the effectiveness of CVDs is weakened by a time lag; because of the injury requirement, the foreign government has a one-period lead in introducing an export subsidy and the home country's countervailing permitted under GATT cannot completely eliminate the injury. To eliminate the injury, the countervailing duty must exceed the subsidy due to the presence of consumer switching costs.

[46] For example, in the previous 2-good 2-country partial-equilibrium model where the export subsidy s^e generates a wedge between the local price of the exporting (home) country and the world price of the export good, $p^l = p^w + s^e$, the importing (foreign) country's CVD tariff τ^* can remove the wedge and recover the original world price through the relationship $p^l + \tau^* = p^w + s^e$ and the market-clearing condition (34).

[47] Cheng (1988) characterizes the home country's optimal use of a tariff (or import subsidy) and a domestic production subsidy (or tax) when a domestic firm and a foreign firm engage in a Bertrand or Cournot competition in the home market. The home country's countervailing policy may emerge in equilibrium if the model is extended to allow the foreign country's subsidy.

Spencer (1988) examines the effectiveness of CVDs when the importing country uses the maximum countervailing tariff permitted under the GATT (rather than the optimal tariff) and the exporting country uses a capital subsidy (i.e., an interest rate subsidy associated with the purchase of additional capital). Spencer shows that this capital subsidy, despite the importing country's use of the maximum CVD, can lead to an increase in exports causing harm to firms in the importing country and that, in a Cournot duopoly setting, a sufficiently small subsidy increases both the profits of the subsidized firm and the subsidizing country's welfare. The finding in the case of a Cournot duopoly means that the exporting country can design a capital subsidy and raise the profits earned from exports more than the amount of the subsidy even under the maximum CVD. Ishikawa and Komoriya (2007) extend the Spencer (1988) model and allow that subsidized firms are heterogeneous. Ishikawa and Komoriya show that a capital subsidy may not benefit all subsidized firms and may reduce the subsidizing country's welfare.

The existing literature appears to remain inconclusive as to whether the countervailing tariff is an optimal response to an export subsidy and whether CVDs can effectively deter the use of export subsidies. It also indicates that the effectiveness of CVDs may differ depending on the nature of subsidies and the heterogeneity of subsidized firms. Importantly, the papers listed above have a common limitation: they all miss the question of whether the importing country's access to CVDs can improve international efficiency. In this sense, it may be reasonable to find a rationale for using CVDs in the trade-agreement literature. While this line of research remains small, a recent literature considers the potential role of CVDs in the context that a domestic subsidy, offered to home exporting firms, causes injury to the foreign import sector and thus results in the foreign CVD claim. The trade-agreement model of Bagwell and Staiger (2006) includes the possibility that, subsequent to tariff commitments, an increase in the production subsidy offered to domestic exporting firms may cause the foreign CVD claim since the consequent rise in the world price reduces the output of the foreign import sector. In their model, the importing country's access to CVDs plays no critical role in supporting efficient outcomes in that the home country, in consideration of the terms-of-trade effect on its own welfare, prefers to avoid raising the world price above the level implied by the tariff negotiation, before it is challenged by the foreign CVD claim.

Using the profit-shifting model discussed above, DeRemer (2013) predicts that a countervailing tariff can substitute for subsidy limits and keep subsidies at efficient levels. Formally, DeRemer defines a GATT equilibrium with CVDs and shows that this equilibrium cannot be further improved by subsidy limits. This finding means that an increase in subsidies generates the cross-border externalities that a market-access preservation rule cannot neutralize, but it is countered by a countervailing tariff. In addition, DeRemer

extends his original model to a 3-country model and offers a reason why subsidy limits are necessary in addition to CVDs. The reason comes from the idea that, under both the market-access preservation constraint and CVDs, the foreign firm entry can still adversely affect the home country through its competition effect on price in the third-country market. This analysis, however, hinges on the scenario that the home country alone imposes CVDs when the third country also suffers from the foreign entry subsidy. This seemingly arbitrary scenario reflects the practical difficulties of countries using CVDs in a coordinated way.

5 Conclusions

This survey makes a report on recent developments of the literature on the SCM agreement. In particular, it presents the literature that analyzes two important regulatory features of the SCM agreement: the restrictive treatment of domestic subsidies and the general prohibition of export subsidies.

The WTO/GATT approach to the treatment of domestic subsidies has evolved from its primary reliance on the market-access preservation rule to the SCM agreement. The existing literature examines the question of whether the WTO's restriction on domestic subsidies is efficiency-enhancing or has gone too far. The terms-of-trade theory offers an efficiency rationale for trade agreements to take a shallow-integration approach to domestic subsidies: international efficiency can be achieved by negotiations on tariffs alone under the non-violation complaints that secure market access against subsequent erosion. Pointing out the potential harm of the strict treatment of domestic subsidies, the terms-of-trade theory asserts that the market-access focus of the GATT rules is a proper treatment of domestic subsidies based on a key regulatory feature: under a market-access preservation rule, a government is granted the flexibility to select its domestic policies up to the point where the government's policies start eroding the market-access level anticipated by earlier tariff negotiations, and it can then achieve domestic efficiency while causing no disruption to the foreign country's market access.

On the other hand, against the backdrop of the SCM agreement and PTAs, an emerging literature reconsiders the GATT-type market-access preservation rule to provide a rationale for trade agreements to take a deep-integration approach to domestic policies. The existing trade-agreement models that support deep integration have a common ingredient: distortions in domestic policies exist in a certain stage when a trade agreement moves governments from the non-cooperative policies to the most cooperative policies. In the terms-of-trade models with private information, domestic distortions are consid-

ered to be an issue that arises subsequent to tariff reductions. The rationale for deep integration in those models hinges on the restriction on domestic efficiency that a trade agreement must impose for the purpose of market-access expansion or self-enforcement. In a different strand of the literature, domestic distortions are considered to be an old issue that originates from the non-cooperative policies. The rationale for deep integration in this line of research is based on the domestic distortions that a trade agreement must eliminate to move governments from the non-cooperative policies to the efficiency frontier.

The current literature on domestic subsidies appears to have two stances. On one hand, the terms-of-trade theory continues to offer a valid theoretical and empirical foundation for the overall design features of the GATT/WTO. On the other hand, a recent literature shows that a shallow-integration approach to domestic policies may have a weakness in particular when there is an additional source of inefficiency such as offshoring or private information. The question of what would be a proper level of depth in the treatment of domestic policies is quite challenging and remains open for future research. Perhaps an optimal level of depth may be conditional on two potentially competing objectives: international efficiency and national sovereignty. A cooperative internalization of cross-border externalities can improve international efficiency, but it may need a deeper level of integration in terms of common international rules or governance that may constrain the national sovereignty over domestic policies.

This survey also reports a recent literature that analyzes the second regulatory features of the SCM agreement: the general prohibition of export subsidies. The existing literature attempts to establish two relevant findings: if import tariffs are sufficiently high, then trade agreements focus on reductions in tariffs, and if import tariffs are sufficiently low, then trade agreements impose restrictions on the use of export subsidies for more efficient outcomes. Although the prohibition of export subsidies sounds reasonable since the use of export subsidies may distort international markets and cause inefficient patterns of trade, it is difficult to formalize the prohibition of export subsidies given the trade-volume-expanding nature of export subsidies. This survey shows that the delocation and profit-shifting models have some success in providing a rationale for the prohibition of export subsidies. The existing literature, however, has not paid sufficient attention to the asymmetric treatment of export subsidies in the GATT/WTO: export subsidies are treated more severely than import tariffs. It is also worthwhile to note that this survey, focusing on the SCM agreement, abstracts from the long-standing discussion about the relationship between exchange rate policy and international trade.[48] The relevant question of whether and how currency manipulation should be addressed by the international

[48] Auboin and Ruta (2013) survey the large body of literature on the relationship between exchange rates and trade.

trading system goes beyond the scope of this survey and remains as an open question in the analytical literature.

This survey finally reports that a recent literature concentrates on export subsidies and its analysis rarely extends to the role of CVDs. It seems evident that more research on CVDs needs to be encouraged. It is important, however, to understand the obstacles that economists encounter if they make an attempt to provide an efficiency rationale for allowing CVDs. First of all, the use of CVDs can only play a critical role of supporting efficient outcomes in the model that has an efficiency rationale for restrictions on export subsidies or export-promoting domestic subsidies. An obvious reason is that the use of CVDs can hardly be justified if those subsidies should be encouraged for international efficiency. A challenging question then lies ahead. What is the rationale for the WTO to allow importing countries to use CVDs rather than to focus on the regulation of those subsidies? The existing literature as in Qiu (1995), Hartigan (1996) and DeRemer (2013) indicates that there are frictions that may reduce the deterrent value of CVDs. The 3-country model of DeRemer (2013) implies that, in the presence of such frictions, CVDs are inferior to subsidy discipline from a global-welfare perspective and that, in the absence of frictions, CVDs can substitute for subsidy discipline but they are redundant at their best. The analytical literature thus appears to have reason to remain silent about the question.

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